FEHILY TIMONEY

DESIGNING AND DELIVERING
A SUSTAINABLE FUTURE

LONGFORDPASS, LITTLETON, LANESPARK, AND DERRYVELLA BOGS – APPLICATION FOR SUBSTITUTE CONSENT

Remedial Environmental Impact Assessment Report

Chapter 08 – Hydrology, Hydrogeology and Water Quality

Prepared for:

Bord na Móna Energy Ltd

BnM

Date: **May 2026**

Unit 3/4, Northwood House, Northwood Crescent,
Northwood, Dublin, D09 X899, Ireland

T: +353 21 496 4133 | E: info@ftco.ie

CORK | DUBLIN | CARLOW

www.fehilytimoney.ie

TABLE OF CONTENTS

LIST OF APPENDICES (VOLUME 3)

LIST OF TABLES

LIST OF PLATES

8. HYDROLOGY, HYDROGEOLOGY AND WATER QUALITY

8.1 Introduction

Hydro-Environmental Services (HES) was engaged by Fehily Timoney (FT) to provide a description and assessment of the residual direct and indirect effects of the peat extraction and ancillary activities at Longfordpass, Littleton, Lanespark, Derryvella bogs (the 'Application Site') on the water aspects (hydrology and hydrogeology) of the receiving environment from July 1988 to the present day. This chapter will also assess the potential effects of the decommissioning and rehabilitation works completed at the Application Site since the cessation of peat extraction in 2017, the proposed rehabilitation works to be completed in the future.

As stated in Chapter 4 - Description of the Development, Volume 2, July 1988 is the baseline environment as this is the year in which the EIA (Directive 85/337/EEC) Directive was required to be transposed into Irish Law. There is no legal requirement to complete a rEIAR on any of the activities occurring at the Application Site prior to the required transposition of this Directive. Nevertheless for completion, we provide a brief overview of the activities occurring at the Application Site from 1941 and the onset of site preparation works up to July 1988. The baseline hydrological and hydrogeological (water) environment in July 1988 is then described in detail along with description of activities from July 1988 to the cessation of peat extraction in 2017, the management of the Application Site since 2017 and the activities intended to be carried out at the Application Site into the future.

This chapter presents:

- An assessment of the effects of the peat extraction and ancillary activities on the hydrological and hydrogeological environment;
- The baseline sensitivity of the receiving hydrological and hydrogeological environment has been assessed based on the baseline site conditions present in July 1988;
- The effects of the receiving hydrological and hydrogeological environment have been assessed over 3 no. phases of the life cycle of the Project. These phases are the Peat Extraction Phase (July 1988 - 2017), the Current Phase (2017 - present day) and the Remedial Phase as described in Chapter 4 - Description of the Development, Volume 2;
- The monitoring and control measures that were implemented during the Peat Extraction Phase;
- The monitoring and control measures that were implemented during the Current Phase;
- The proposed mitigation measures associated with Remedial Phase; and,
- The residual effects along with the cumulative effects of the proposed Littleton Wind Farm development and other relevant projects in the vicinity of the Application Site.

8.1.1 Statement of Authority

Hydro-Environmental Services (HES) are a specialist geological, hydrological, hydrogeological and environmental practice which delivers a range of water and environmental management consultancy services to the private and public sectors across Ireland and Northern Ireland. HES was established in 2005, and our office is located in Dungarvan, County Waterford.

Our core areas of expertise and experience include upland hydrology and windfarm drainage design. We routinely complete impact assessment reports for hydrological and hydrogeological aspects for a variety of project types.

This chapter of the rEIAR was prepared by Michael Gill, Conor McGettigan and Nitesh Dalal.

Michael Gill (BA, BAI, Dip Geol., MSc, MIEI) is an Environmental Engineer and Hydrogeologist with over 23 years' environmental consultancy experience in Ireland. Michael has completed numerous geological, hydrological and hydrogeological impact assessments of wind farms and renewable projects in Ireland. For example, Michael has worked on the rEIARs for Oweninny WF, Cloncreen WF, and Yellow River WF, and over 120 other wind farm related projects across the country. Michael has also worked on rEIARs for Cleanrath WF, and for peat extraction on several Bord na Móna bogs including the Ballivor Bog Group and Lemanaghan Bog, and also rEIARs for a number of quarry sites.

Conor McGettigan (BSc, MSc) is an Environmental Scientist with over 5 years' experience in the environmental sector in Ireland. Conor holds an M.Sc. in Applied Environmental Science (2020) and a B.Sc. in Geology (2016) from University College Dublin. Conor routinely prepares the land, soils and geology chapters of environmental impact assessment reports for developments on peatlands. Conor has also prepared the hydrology and hydrogeology chapter of the rEIAR completed for the substitute consent application for the peat extraction activities at the Ballivor Bog Group and the rEIAR completed for the peat extraction at Lemanaghan Bog.

Nitesh Dalal (B.Tech, PG Dip., MSc) is an Environmental Scientist with over 7 years' experience in environmental consultancy and environmental management in India. Nitesh holds a M.Sc. in Environmental Science from University College Dublin (2024), a PG Diploma in Health, Safety and Environment from Annamalai University, India (2021) and B.Tech. in Environmental Engineering (2016) from Guru Gobind Singh Indraprastha University, India (2016).

8.2 Assessment Methodology

8.2.1 Relevant Legislation

The rEIAR is prepared in accordance with the requirements of European Union Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment (the 'EIA Directive') as amended by Directive 2014/52/EU.

The requirements of the following legislation are also complied with:

- Planning and Development Acts, 2000 (as amended);
- Planning and Development Regulations, 2001 (as amended);
- S.I. No. 477/2011: European Communities (Birds and Natural Habitats) Regulations, implementing EU Directives 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (the Habitats Directive) and Directive 2009/147/EC on the conservation of wild birds (the Birds Directive);
- S.I. No. 293/1988: Quality of Salmon Water Regulations;
- Water Framework Directive (2000/60/EC) (as amended by Decision No. 2455/2011/EC; Directive 2008/32/EC; Directive 2008/105/EC; Directive 2009/31/EC; Directive 2013/39/EU; Council Directive 2013/64/EU; and Commission Directive 2014/101/EU ("WFD").
- S.I. No. 272/2009: European Communities Environmental Objectives (Surface Waters) Regulations 2009, as amended, and S.I. No. 722/2003 European Communities (Water Policy) Regulations, as amended, which implement EU Water Framework Directive (2000/60/EC) and provide for the implementation of 'daughter' Groundwater Directive (2006/118/EC);
- S.I. No. 122/2014: European Union (Drinking Water) Regulations, arising from EU Directive 98/83/EC on the quality of water intended for human consumption (the Drinking Water Directive) and WFD 2000/60/EC (the Water Framework Directive);
- S.I. No. 684/2007: Waste Water Discharge (Authorisation) Regulations;

- S.I. No. 9/2010: European Communities Environmental Objectives (Groundwater) Regulations 2010, as amended;
- S.I. No. 296/2009: European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009, as amended; and,
- S.I. No. 99/2023: European Union (Drinking Water) Regulations.

8.2.2 Relevant Guidance

The Hydrology and Hydrogeology chapter of this rEIAR is carried out in accordance with guidance contained in the following:

- Circular Letter PL 1/2017: Implementation of Directive 2014/52/EU on the effects of certain public and private projects on the environment (EIA Directive);
- European Commission (2017): Environmental impact assessment of projects – Guidance on the preparation of the environmental impact assessment report (Directive 2011/90/EU as amended by 2014/52/EU);
- Environmental Protection Agency (2022): Guidelines on the Information to be Contained in Environmental Impact Assessment Reports;
- Environmental Protection Agency (2006): Environmental Management in the Extractive Industry;
- Institute of Geologists Ireland (2013) Guidelines for Preparation of Soils, Geology & Hydrogeology Chapters in Environmental Impact Statements;
- National Roads Authority (2008) Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes;
- Inland Fisheries Ireland (2016): Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Watercourses;
- PPG1 - General Guide to Prevention of Pollution (UK Guidance Note);
- PPG5 – Works or Maintenance in or Near Water Courses (UK Guidance Note);
- CIRIA (Construction Industry Research and Information Association) Guidance on 'Control of Water Pollution from Linear Construction Projects' (CIRIA Report No. C648, 2006);
- Control of Water Pollution from Construction Sites - Guidance for Consultants and Contractors. CIRIA C532. London, 2001;
- OPW (2009): The Planning System and Flood Risk Management;
- Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (DoHPLG, 2018); and,
- Tipperary County Council (2022): Tipperary County Development Plan (2022-2028).

8.2.3 Consultation

The scope for this chapter of the rEIAR has also been informed by consultation with statutory consultees, bodies with environmental responsibility and other interested parties. Matters raised by Consultees in their responses with respect to the water environment are summarised in Table 8-2 below.

Table 8-1: Summary of Water Environment Scoping Responses

Consultee	Description	Adressed in Section X
Uisce Éireann	UI state that they do not have the capacity to advise on scoping individual projects, and provided a standard response including ensuring that the development does not affect any UE drinking water source.	The effects of the Project on local drinking water supplies are assessed in Section 8.6.1.6 for the Peat Extraction Phase, Section 8.6.2.5 for the Current Phase and Section 8.6.3.6 for the Remedial Phase.

Table 8-2: List of Consultation Responses

Consultee Name	Summary of Responses Received
Minister for Climate, Energy and the Environment	Key points relevant to this rEIAR chapter: • Identifies the site as nationally important in terms of post-glacial climate record preserved in peat and pollen stratigraphy. • States that the integrity of peat and soil profiles may be impacted. • Requires the development to treat the site as a constraint to avoid damaging geological and palaeo-environmental records. • Requests mitigation, and where integrity cannot be preserved, recording of soil/peat exposures during construction.
Geological Survey Ireland (GSI)	GSI's remit includes: • Geology (bedrock, quaternary, geohazards) • Groundwater • Geological heritage (Geoheritage sites) Since GSI has aligned its comments with the Minister, they reinforce the geological/peatland significance of the site.
Irish Peatland Conservation Council (IPCC)	Although focused on biodiversity and climate, their response is highly relevant to peat soils and geomorphology, particularly given the site's peatland. Key points affecting Land/Soils/Geology: • Acknowledges decades of industrial peat extraction and its residual effects. • Notes loss of ecosystem services, including carbon sequestration, which is inherently linked to peat soil integrity and depth. • Highlights the site's fragmented landscape and soil degradation.

Consultee Name	Summary of Responses Received
Transport Infrastructure Ireland (TII)	Mostly transport-focused, but includes points that can relate to geology and soils: Relevant items: • Construction methods in proximity to national road assets • Stability of ground near road infrastructure • Haul routes - soil compaction, settlement, geotechnical considerations • Potential requirement for geotechnical assessments around structures/drainage.

8.2.4 Desk Study

A desk study of the Application Site and the surrounding area was completed in the Autumn of 2023 to collect all relevant hydrological, hydrogeological and meteorological data. The desk study was completed to supplement site walkover surveys, drainage mapping and site investigations. The desk study information has been checked and updated, where necessary, in December 2023 and January 2024, and again in November and December 2025.

The desk study involved consultation with the following sources:

- Littleton Bog Group Integrated Pollution Control (IPC) Licence (Ref. P0499-01) Environmental Protection Agency (included as Appendix 4-1, Volume 3);
- Bord na Móna Cutaway Bog Decommissioning and Rehabilitation Plans (included in Appendix 4-2, Volume 3):
- Longfordpass Bog Cutaway Bog Decommissioning and Rehabilitation Plan 2026;
- Littleton Bog Cutaway Bog Decommissioning and Rehabilitation Plan 2026;
- Lanespark, Ballybeg and Derryvella Bog Cutaway Bog Decommissioning and Rehabilitation Plan 2025;
- Bord na Móna Annual Reports which contain information relevant to the Application Site;
- IPC Licence, Annual Environmental Reports 2002-2024 (included in Appendix 4-3, Volume 3 (2018 to 2024 are also publicly available));
- Inspection of production records from Littleton Works;
- Aerial Imagery from 1973, 1988, 1995, 2004 and 2017 (included in Appendix 4-4, Volume 3);
- Bord na Móna, IPC Licence Environmental Code of Practice for Peat Energy Works (included as Appendix 4-5, Volume 3);
- Environmental Protection Agency databases (www.epa.ie);
- Geological Survey of Ireland - Groundwater Database (www.gsi.ie);
- Met Eireann Meteorological Databases (www.met.ie);
- National Parks and Wildlife Services Public Map Viewer (www.npws.ie);
- Water Framework Directive “catchments.ie” Map Viewer (www.catchments.ie), including all relevant River Basin Management Plans (RBMPs);
- Long-term EPA water quality monitoring data (catchments.ie/data);

- Bedrock Geology 1:100,000 Scale Map Series, Geological Survey of Ireland (GSI, 1999);
- Geological Survey of Ireland - Groundwater Body Characterisation Reports;
- OPW Flood Mapping Databases (www.floodinfo.ie);
- Environmental Protection Agency – "Hydrotool" Map Viewer (www.epa.ie);
- Aerial Photography, 1@5,000 and 6" base mapping; and,
- Myplan.ie: National Planning Applications Map Viewer (https://myplan.ie/national-planning-application-map-viewer).

8.2.5 Monitoring and Site Investigations

HES completed site inspections, walkover surveys, drainage mapping, peat probing and baseline monitoring at the Application Site as part of this remedial Environmental Impact Assessment (rEIAR) and to inform the proposed Littleton Wind Farm planning application. These site investigations comprised of peat probing and drainage mapping completed by HES on several dates between 2023 and 2025. These surveys were completed by Michael Gill and Conor McGettigan (please refer to Section 8.1.1 for qualifications and experience).

In addition to the site investigations completed by HES, several additional site investigations have been completed at the Application Site to further inform this rEIAR and the proposed Littleton Wind Farm application. These site investigations included extensive peat probing investigations completed by FT, the excavation of 41 no. trial pits and the drilling of 7 no. rotary core boreholes at the Application Site by Ground Investigations Ireland (GII).

In summary, the site investigations to address the Hydrology and Hydrogeology chapter of this rEIAR are as follows:

- HES completed walkover surveys, drainage mapping at the Site on 28th February 2023, 16th January 2025 and 17th September 2025 whereby water flow directions and drainage patterns were recorded;
- HES completed peat probing at the Application Site in order to determine the depth of peat and the nature of the underlying subsoils;
- HES completed an inspection of the existing and watercourse/drain crossings within the Site on 17th September 2025;
- GII completed a total of 28 no. trial pits in July and August 2022. The results of these site investigations are presented in GII's October 2022 Ground Investigation Report (Appendix 7-1, Volume 3):
- GII completed an additional 11 no. trial pits in April 2023. The results of these site investigations are presented in GII's June 2023 Ground Investigation Report (Appendix 7-2, Volume 3);
- GII completed additional site investigations comprising of 10 no. trial pits and 7 no. rotary core boreholes at the Application Site and adjacent lands in October, November and December 2023. The results of these site investigations are presented in full in GII's March 2024 Ground Investigation Report (Appendix 7-3, Volume 3); and,
- Triturus Environmental Ltd completed baseline aquatic monitoring, including macroinvertebrate sampling, at a total of 30 no. river sites in September 2023.The results are presented in the Triturus March 2024 Aquatic Baseline Report (Appendix 6-2, Volume 3).

The site-specific data obtained from the above site investigations and monitoring was supplemented with recent and historic data supplied by the Applicant. This included Lidar data of the Application Site and water quality monitoring as per IPC Licence requirements. Long-term EPA water quality monitoring data on the watercourses downstream of the Application Site was also consulted.

8.2.6 Impact Assessment Methodology

The guideline criteria (EPA, 2022) for the assessment of likely significant effects require that likely effects are described with respect to their extent, magnitude, type (i.e. negative, positive or neutral) probability, duration, frequency, reversibility, and transfrontier nature (if applicable). The descriptors used in this environmental impact assessment are those set out in the EPA (2022).

In addition to the above methodology, the sensitivity of the water environment receptors was assessed on completion of the desk study and baseline study. Levels of importance which are defined in Table 8-3 for hydrology and Table 8-4 for hydrogeology are used to assess the potential effects that the Project may have had on them.

Table 8-3: Estimation of Importance of Hydrology Criteria (NRA, 2008)

Importance	Criteria	Example
Extremely High	Attribute has a high quality or value on an international scale	River, wetland or surface water body ecosystem protected by EU legislation, e.g. 'European sites' designated under the Habitats Regulations or 'Salmonid waters' designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988.
Very High	Attribute has a high quality or value on a regional or national scale	River, wetland or surface water body ecosystem protected by national legislation – NHA status. Regionally important potable water source supplying >2500 homes. Quality Class A (Biotic Index Q4, Q5). Flood plain protecting more than 50 residential or commercial properties from flooding. Nationally important amenity site for a wide range of leisure activities.
High	Attribute has a high quality or value on a local scale	Salmon fishery. Locally important potable water source supplying >1000 homes. Quality Class B (Biotic Index Q3-4). Flood plain protecting between 5 and 50 residential or commercial properties from flooding.
Medium	Attribute has a medium quality or value on a local scale	Coarse fishery. Local potable water source supplying >50 homes Quality Class C (Biotic Index Q3, Q2-3). Flood plain protecting between 1 and 5 residential or commercial properties from flooding.
Low	Attribute has a low quality or value on a local scale	Locally important amenity site for small range of leisure activities. Local potable water source supplying <50 homes.

Importance	Criteria	Example
		Quality Class D (Biotic Index Q2, Q1) Flood plain protecting 1 residential or commercial property from flooding. Amenity site used by small numbers of local people.

Table 8-4: Estimation of Importance of Hydrogeology Criteria (NRA, 2008)

Importance	Criteria	Example
Extremely High	Attribute has a high quality or value on an international scale	Groundwater supports river, wetland or surface water body ecosystem protected by EU legislation, e.g. SAC or SPA status.
Very High	Attribute has a high quality or value on a regional or national scale.	Regionally Important Aquifer with multiple wellfields. Groundwater supports river, wetland or surface water body ecosystem protected by national legislation - NHA status. Regionally important potable water source supplying >2500 homes Inner source protection area for regionally important water source.
High	Attribute has a high quality or value on a local scale	Regionally Important Aquifer Groundwater provides large proportion of baseflow to local rivers. Locally important potable water source supplying >1000 homes. Outer source protection area for regionally important water source. Inner source protection area for locally important water source.
Medium	Attribute has a medium quality or value on a local scale	Locally Important Aquifer. Potable water source supplying >50 homes. Outer source protection area for locally important water source.
Low	Attribute has a low quality or value on a local scale	Poor Bedrock Aquifer Potable water source supplying <50 homes.

8.2.7 Overview of Impact Assessment Process

The conventional source-pathway-target model (see Plate 8-1, below) was applied to assess potential impacts on downstream environmental receptors (see Plat 8-1, bottom as an example, earthworks - peat extraction) as a result of the Project.

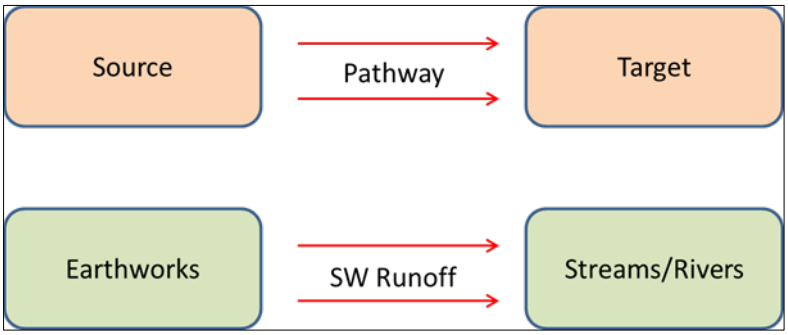

Plate 8-1: Example of Source-Pathway-receptor model

The assessment of effects is Step No. 6 of 7 in the rEIAR process. In order to provide an understanding of the stepwise impact assessment process applied below (Sections 8.6.1 to 8.6.3), a summary guide is presented below, which defines the steps (Steps 6a to 6g) taken in each element of the impact assessment process. The guide also provides definitions and descriptions of the assessment process and shows how the source-pathway-target model and the EPA impact descriptors are combined.

Using this defined approach, this impact assessment process is then applied to all peat extraction and ancillary activities which had the potential to generate a source of significant adverse impact on the hydrological and hydrogeological (including water quality) environments.

Table 8-5: Impact Assessment Process Steps

Identification and Description of Potential Impact Source **This section presents and describes the activity that brings about the potential impact or the potential source of pollution. The significance of effects is briefly described.**		
Step 6b	Pathway / Mechanism:	The route by which a potential source of impact can transfer or migrate to an identified receptor. In terms of this type of development, surface water and groundwater flows are the primary pathways, or for example, excavation or soil erosion are physical mechanisms by which potential impacts are generated.
Step 6c	Receptor:	A receptor is a part of the natural environment which could potentially be impacted upon, e.g. human health, plant / animal species, aquatic habitats, soils/geology, water resources, water sources. The potential impact can only arise as a result of a source and pathway being present.
Step 6d	Pre-mitigation Impact:	Impact descriptors which describe the magnitude, likelihood, duration and direct or indirect nature of the potential impact before mitigation is put in place.

Identification and Description of Potential Impact Source This section presents and describes the activity that brings about the potential impact or the potential source of pollution. The significance of effects is briefly described.		
Step 6e	Proposed Mitigation Measures:	Control measures will be put in place to prevent or reduce all identified significant adverse impacts. In relation to this type of development, these measures are generally provided in two types: (1) mitigation by avoidance, and (2) mitigation by (engineering) design.
Step6f	Post-Mitigation Residual Impact:	Impact descriptors which describe the magnitude, likelihood, duration and direct or indirect nature of the potential impacts after mitigation are put in place.
Step 6g	Significance of Effects:	Describes the likely significant post-mitigation effects of the identified potential impact source on the receiving environment.

8.2.8 Study Area

The Water Study Area for the hydrological and hydrogeological remedial impact assessment is defined by the regional surface water catchment and groundwater bodies within which the Application Site is located.

A regional hydrology map showing WFD surface water catchments and sub-catchments is included as Plate 8-3. The relevant surface water catchments within which the Application Site is located are detailed in Section 8.4.2. In addition, the bedrock aquifers and groundwater bodies which underlie the Application Site are detailed in Section 8.4.7.

8.2.9 Limitations and Difficulties Encountered

Drainage works for peat extraction commenced at its earliest at the Application Site in 1941. The retrospective impact assessment has been carried out based on the reasonable availability of information relating to the peat extraction and ancillary activities. The retrospective assessment has been limited by the availability, completeness, accuracy and accessibility of historical baseline environmental data.

8.3 Site Landuse History Summary

8.3.1 Summary

The Application Site comprises of 4 no. bogs located in east Co. Tipperary. The bogs include Lanespark and Derryvella bogs in the south, Littleton Bog towards the centre and Longfordpass Bog in the north. The Application Site comprises an area of approximately 1,616 hectares (ha). Bog drainage works began at the Application Site in 1941 followed by the commencement of peat extraction from 1952 which ceased in 2017.

The closest settlements to the Application Site are Urlingford (approximately 5 km to the north-east), Gortnahoe (approximately 2.5 km to the east), Twomileborris (approximately 2 km to the west), Littleton (approximately 2.5 km to the west) and New Birmingham (approximately 2 km to the east). The town of Thurles is located approximately 9km to the west of the Application Site.

The landcover within the Application Site currently comprises a mix of bare cutaway peat, re-vegetated peat, degraded blanket bog, scrub, low woodland, remnant high bog and coniferous plantations.

8.3.2 Site Topography

The topography of the Application Site has changed through time due to the peat extraction and ancillary activities. As discussed in Section 4.3.2 the topography of the Application Site was estimated to range between 123 and 133mOD prior to the onset of any peat extraction activities or associated site preparation works (i.e. drainage and acrotelm removal). It is assumed that prior to the installation of drainage to facilitate peat extraction, the Application Site was virgin bog and was therefore an active raised bog. The topography has subsequently been lowered at each of the bogs due to drainage related subsidence and the removal of peat.

8.3.3 Historic Land Use Changes

The primary land-use change associated with the peat extraction process occurred during the initial drainage of the bog in advance of peat extraction. Constructed drainage ditches drained the upper surface of the bog by lowering the local peat water table. At this time at the Application Site, ancillary features were also constructed including railway lines, machine passes, canteens, work sites, welfare facilities, mobile fuel tanks, fixed fuel tanks and peat loading facilities. After the Application Site was drained, vegetation was removed from the bog surface, leaving only bare peat fields between the drains. During the Peat Extraction Phase, only minimal landuse change occurred which predominantly related to minor annual topographic changes caused by ongoing peat extraction. While the peat extraction activity was ongoing it was not possible to rehabilitate the underlying peatland.

Land and landuse changes were investigated from July 1988 to the present day. A full description of landuse changes across the Application Site is described in Chapter 7 - Land, Soils and Geology, Volume 2. The primary change to land during the peat extraction process occurred during the initial site drainage and the removal of vegetation in preparation for peat extraction activities. The timing of drainage and the initiation of peat extraction varied across the Application Site. Littleton Bog was the first bog to be drained, with drainage and vegetation clearance commencing in 1941 and would have experienced a relatively abrupt change in land cover from this date to the beginning of commercial peat extraction in 1952. Meanwhile, vegetation clearance and drainage insertion commenced at Longfordpass Bog in 1947 and at Lanespark and Derryvella bogs in 1968. Peat extraction commented at Longfordpass Bog at the same time as Littleton Bog (1952), and later in Lanespark and Derryvella bogs (1973). By 1988, all bogs comprising the Application Site had been drained and peat extraction was in progress.

Peat extraction was formally ceased at the Application Site by Bord na Móna in 2017. This has allowed the former bare peat production fields to begin to revegetate. However, it will likely take some time and measures to aid the site rehabilitation were outlined in Bord na Móna Cutaway Bog Decommissioning and Rehabilitation Plans (Appendix 4-2, Volume 3). Works associated with the Rehabilitation Phase 1 works were completed at the Application Site during the Current Phase, and additional Rehabilitation Phase 2 rehabilitation works are proposed for Derryvella Bog to be completed during the Remedial Phase.

The following points describe the baseline (July 1988) environment and subsequent land-use changes at each of the individual bogs comprising the Application Site. The general topography of the 4 bogs is illustrated in Plate 8-2 below.

- In 1988, peat extraction was being carried out across the majority of Littleton Bog, c. 795ha were subject to peat extraction, while c. 99ha were drained (but not subject to peat extraction). In 1995, there was a significant reduction in peat extraction at Littleton Bog, c. 134ha were subject to peat extraction, c. 760ha were drained (but not subject to peat extraction). A gradual and consistent reduction in peat extraction activity can be seen in both Littleton North and Littleton South from 2004 onwards. Cessation of all peat extraction activity had occurred by 2017. There is currently 1 no. silt pond on the western boundary of Littleton Bog. There are 4 no. pump sites at Littleton Bog, none of which are active today.
- In 1988, peat extraction was at its peak across Lanespark Bog (c. 239ha subject to peat extraction), occupying the majority of the central portion with some undeveloped land along the northeastern and southwestern boundaries. Between 1988 and 2017, the extent of peat extraction reduced. In 1995, c. 201ha were subject to peat extraction. In 2004, c.65ha were subject to peat extraction. Cessation of all peat extraction occurred by 2017. There are no pump sites in Lanespark Bog. There are currently 4 no. silt ponds (2 no. along the northern boundary and 2 no. along the southern boundary of the bog).
- In 1988, peat extraction was at its peak across Derryvella Bog (c.92ha in subject to peat extraction). Between 1988 and 2017, the extent of peat extraction reduced. In 1995, c.44ha were subject to peat extraction. In 2004, c.30ha were subject to peat extraction. Cessation of all peat extraction occurred by 2017. There are no pumps in Derryvella Bog. There is currently 1 no. silt pond located at the western boundary of the bog.
- In 1988, peat extraction was at its peak across the Longfordpass Bog (c. 226ha were subject to peat extraction). In 1988, there was 1 no. pumps and 3 no. silt ponds installed on Longfordpass Bog. Between 1988 and 2017, the extent of peat extraction gradually decreased. In 1995, c. 173ha were subject to peat extraction. Cessation of peat extraction had occurred by 2017.

8.3.4 Site Description and Topography

Corine land cover maps (2018) (www.epa.ie) show that the Application Site is predominantly comprised of 'peat bogs' with some coniferous forests mapped in the south of Littleton Bog. Landcover in the surrounding area is mapped largely as 'agricultural pastures' while some areas of the Application Site itself are bordered by smaller areas of coniferous forestry and transitional woodland scrub.

Current land and landcover at the Application Site was verified during site walkover surveys, from the inspection of recent aerial imagery and Bord na Móna habitat mapping. Peat extraction formally ceased at the Application Site in 2017. All stockpiles of peat were removed from the Application Site by mid-2019. The removal of rail infrastructure in Lanespark and Derryvella bogs was completed in 2024. Railway infrastructure remains at Littleton Bog. Rehabilitation Phase 1 works, which included drain blocking and hydrological management at the bogs, have also been completed between 2018 and 2021. Land use at the Application Site now comprises primarily of bare cutaway peat, with developing pioneer vegetation and coniferous forestry and woodland habitats in the south of Littleton Bog. This corresponds with the Applicant's records of the historic peat extraction areas which suggest that peat extraction ceased in these areas by 2004, which has allowed significant time for revegetation.

The current topography of the Application Site is relatively flat with an elevation range of between approximately 117 and 130mOD (metres above Ordnance Datum). Topography at the Application Site has been modified through peat extraction and ancillary activities including associated drainage works. Today the highest elevations are found at headlands and remnant peat banks which create a boundary berm, forming a basin effect within the former extraction areas of the bog. These remnant peat banks and headlands provide an approximation (albeit drained and subsided) of the original ground elevations which existed across the Application Site prior to the commencement of any peat extraction and ancillary activities. Topography across the Application Site is shown in Plate 8-2.

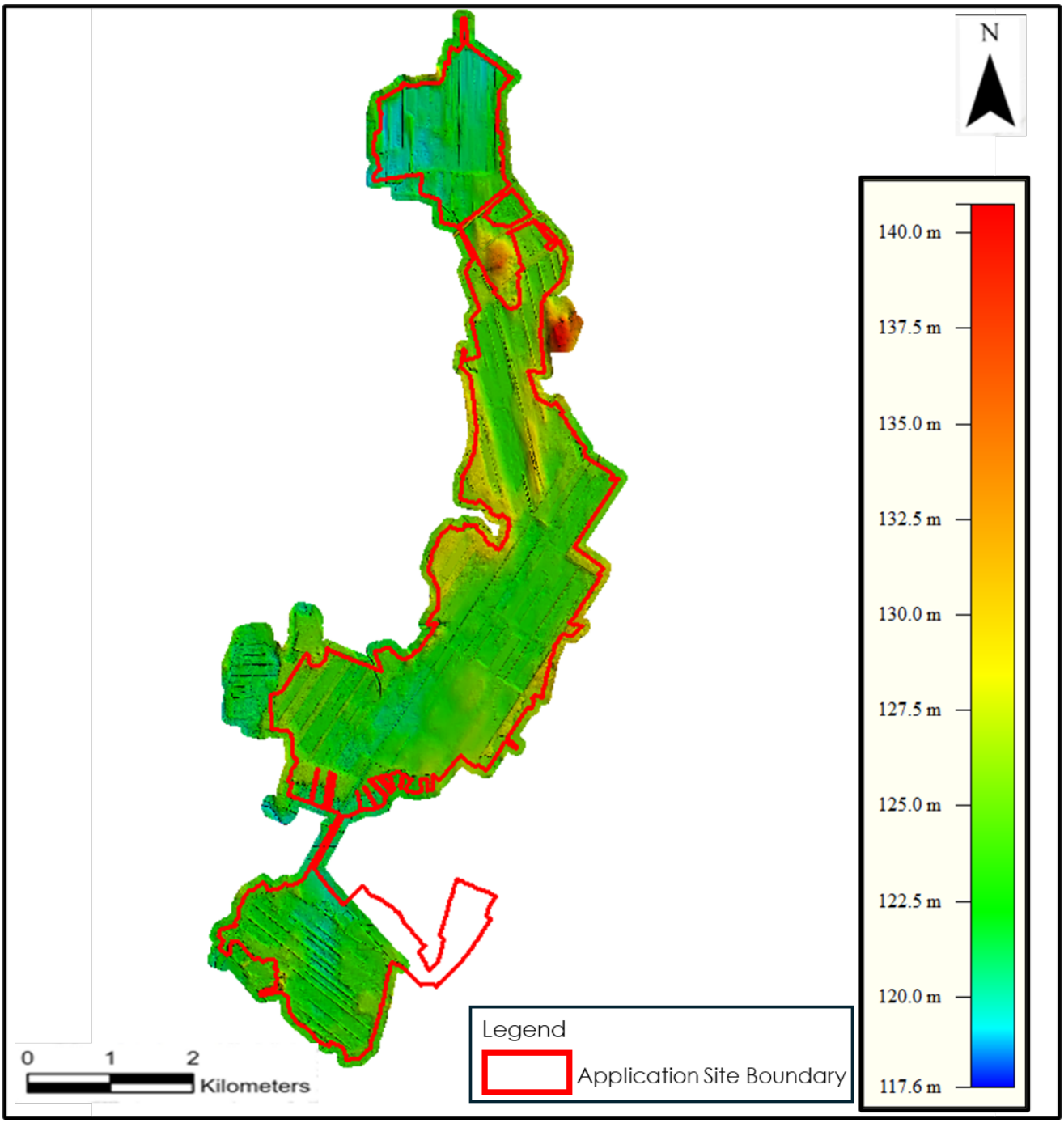

Plate 8-2: Topography across the Application Site

8.4 Establishing the 1988 Baseline Environment

8.4.1 Water Balance

Long term Annual Average Rainfall (AAR) and evaporation data were sourced from Met Éireann (www.met.ie).

The 30-year AAR (1981-2010) recorded at Littleton rainfall station, located approximately 1km southwest of Application Site are presented in Table 8-6. The long-term AAR at this station is 958mm/year.

Met Éireann also provide a grid of AAR for the entire country for the period of 1991 to 2020. Based on these more site-specific modelled rainfall values, the AAR at the Application Site ranges from 934 to 1,004mm/year, with the greatest values in Lanespark and Derryvella bogs in the south. The conservative AAR for the Application Site is taken to be 1,004mm/year (this is considered to be the most accurate estimate of AAR from the available sources).

Table 8-6: Average long-term Rainfall Data (mm)

Station		X-Coord		Y-Coord		Ht (mOD)		Opened		Closed		
Littleton Rainfall Station		219700		153400		122		1950		1982		
Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
98.3	72.1	74.2	63.5	67.0	68.7	65.1	78.9	76.4	108.9	91.3	93.8	958.1
Site (X-Cord: 217000, Y-Cord: 150000)												
Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
100	77	74	66	66	74	71	83	78	106	105	105	1,004

The closest synoptic station where the average Potential Evapotranspiration (PE) is recorded is at Kilkenny, ~26km east of the Application Site. The long-term average PE for this station is ~459mm/year. This value is used as a best estimate of the PE at the Application Site. Actual Evaporation (AE) is estimated as ~436mm/year (which is 0.95 × PE).

The Effective Rainfall (ER) represents the water available for runoff and groundwater recharge. The ER for the Application Site is calculated as follows:

Effective Rainfall (ER) = Average Annual Rainfall (AAR) – Actual Evaporation (AE)
ER = 1,004mm/year – 436mm/year
ER = 568mm/year

The GSI estimate that the groundwater recharge coefficient for the Application Site is 4% (www.gsi.ie), with this estimate being provided based on the occurrence and extent of basin peat. Based on this recharge coefficient (4%) the average annual groundwater recharge for the Application Site is estimated to be ~23mm/year (i.e. 4% of the effective rainfall (568mm) for the Application Site). This means that the hydrology of the Application Site is characterised by very high surface water runoff rates and very low groundwater recharge rates. Therefore, conservative annual recharge and runoff rates for the Application Site are estimated to be 23mm/yr and 545mm/yr respectively.

The water balance presented above is unlikely to have changed significantly from 1988 to the period covered by the 1991-2020 Met Éireann data. Raised peat bogs are an excellent store of water. Pre-development when the storage capacity of the peat is reached surface water runoff will occur whereby rainwater would have moved slowly across the bog before discharging to fens and other wetland habitats at the bog margin. In the July 1988 baseline and in the present day, however, drainage channels act as preferential flowpaths which allow surface water to leave the Application Site. These channels generally have a low gradient and the on-site drainage systems have some inherent storage and attenuation, and likely release runoff water at slightly higher rates than that of pre-development times. Meanwhile, the runoff rates between the July 1988 baseline and the present day are unlikely to have changed significantly as drainage had been inserted at the Application Site by July 1998. There may have been a very slight decrease in runoff rates due to the upgrade in silt ponds at the Application Site in the 1990s.

Met Éireann's Translate Project (https://www.met.ie/science/translate) provides projections for a range of future climate change scenarios, as Ireland's future climate will depend on global greenhouse gas emissions reductions. The severity of any future climate change will depend on the degree of future warming. In relation to precipitation changes, the models show that summer rainfall may decrease by approximately 9% and winter rainfall could increase by up to 24%. In a future scenario where the average global temperature is 1.5°C above the pre-industrial average, average winter and summer precipitation rates are projected to be 3.92mm/day and 2.34mm/day respectively in Co. Tipperary. In a future scenario 4°C above the pre-industrial average, the average winter and summer precipitation rates in Co. Tipperary are projected to be 4.31mm/day and 2.08mm/day respectively.

8.4.2 Regional and Local Hydrology

Regionally the Application Site is located in the River Suir surface water catchment within Hydrometric Area 16 of the South Eastern River Basin District. The Suir Catchment includes the area drained by the River Suir and all streams entering the tidal water between Drumdowney and Cheekpoint, Co. Waterford. The catchment has a total area of 3,542km^2. In the vicinity of the Application Site, the main tributary of the River Suir is the Drish River. This river discharges into the River Suir to the south of Thurles and ~7.7km west of the Application Site. The River Suir then continues to flow to the south, past Cahir, before it veers to the east, flowing through Clonmel, before it becomes tidal in the vicinity of Carrick-on-Suir.

A regional hydrology map is shown in Plate 8-3.

More locally the Application Site is located in the Suir_040 WFD sub-catchment (Suir_SC_040) and is drained by the Drish River and its tributaries. This Site is mapped within a total of 9 no. WFD river sub-basins as detailed in the succeeding paragraphs.

- The southwest of Lanespark Bog is mapped in the Breagagh (Tipperary)_010 WFD river sub-basin. The closest mapped watercourses to this area of the Application Site is the Ballyley River, referred to on the EPA online mapping as the Breagagh River (EPA Code: 16B03) (note that for consistency this watercourse will be referred to as the Breagagh River within this chapter). This watercourse flows to the northwest ~140m from the Application Site. Further downstream, the Breagagh River discharges into the Drish River (EPA Code: 16D02) near Archerstown Bridge to the south of Thurles, just upstream of its confluence with the River Suir.
- The north of Lanespark Bog and the east of Derryvella Bog are mapped in the North Glengoole_010 WFD river sub-basin. The closest mapped watercourse to this area of the Application Site is the EPA named North Glengoole Stream (EPA Code: 16N28) which is a tributary of the Black River, referred to by the EPA as the Black (Two Mile Borris) River (EPA Code: 16B01). The North Glengoole Stream flows to the southwest along the eastern boundary of Derryvella Bog before veering to the northeast and passing along the northern boundary of Lanespark Bog.

- A large area in the south of Littleton Bog is mapped in the Black (TwoMileBorris)_010 WFD river sub-basin. This area is drained by the Black (Two Mile Borris) River. The EPA map the Black (Two Mile Borris) River to flow to the south/southeast along the eastern boundary of Littleton Bog. The Black (Two Mile Borris) River continues to flow to the northwest and discharges into the Drish River to the north of Twomileborris.
- Much of the centre of Littleton Bog is mapped in the Clover_010 WFD river sub-basin. The EPA map 2 no. watercourses to flow to the northwest from this area of Littleton Bog. One of these streams is referred to as the Derheen River on local basemaps and is not assigned a name by the EPA. The other stream is referred to as the Clover Stream (EPA Code: 16C04) on the EPA blueline database. These streams merge downstream of the Application Site to form the Clover River. The Clover River discharges into the Black (Two Mile Borris) River to the north of the village of Twomileborris.
- The northeast of Littleton Bog is mapped in the Drish_010 WFD river sub-basin. This area of the Application Site is drained by the Drish River (EPA Name: 16D02) which flows to the north. It is noted that this watercourse is referred to as the Black River on local base maps and is only referred to as the Drish River downstream of Ballyduff Bridge near Shanballyduff (For the purposes of this chapter the Drish River will be used to refer to this watercourse in order to be consistent with the EPA nomenclature and to avoid confusion with the Black (Two Mile Borris) River).
- A small area in the north of Littleton Bog is mapped in the Drish_020 WFD river sub-basin. The Drish River flows to the northwest ~1.3km from this area of the Application Site.
- The northern section of Longfordpass Bog is mapped in the Drish_030 WFD river sub-basin. The Drish River flows to the west ~550m from the Application Site.
- The majority of the Longfordpass Bog and a small area in the northwest of Littleton Bog are mapped in the Drish_050 WFD river sub-basin. An unnamed stream is mapped by the EPA to flow along the western boundary of this area before it discharges into the Drish River.

A local hydrology map is shown as Plate 8-4

Table 8-7 summarises the location and receiving waterbodies of each of the bogs which comprise the Application Site in accordance with the Water Framework Directive (WFD) terminology.

Table 8-7: WFD Catchments, sub-catchments and river sub-basins

Bog Name	WFD River Sub-Basin	WFD Sub-Catchment	WFD Regional Surface Water Catchment
Longfordpass Bog	Drish_050	Suir_SC_040	River Suir Catchment
	Drish_030		
Littleton Bog	Drish_050		
	Drish_020		
	Drish_010		
	Clover_010		
	Black (Twomileborris)_010		
Lanespark Bog	North Gengoole_010		
	Breagagh_010		
Derryvella Bog	North Gengoole_010		
	Black (Twomileborris)_010		

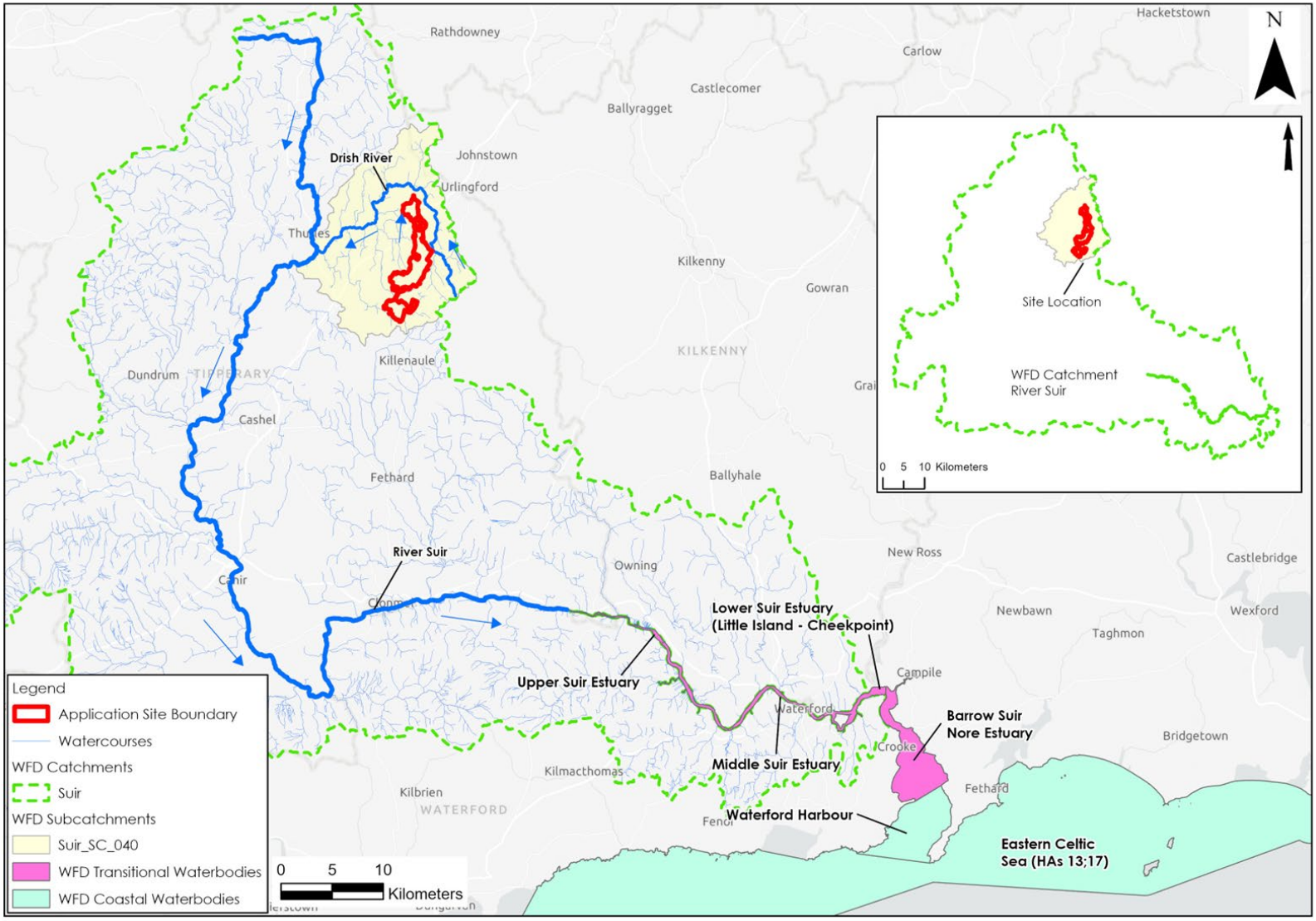

Plate 8-3: Regional Hydrology Map

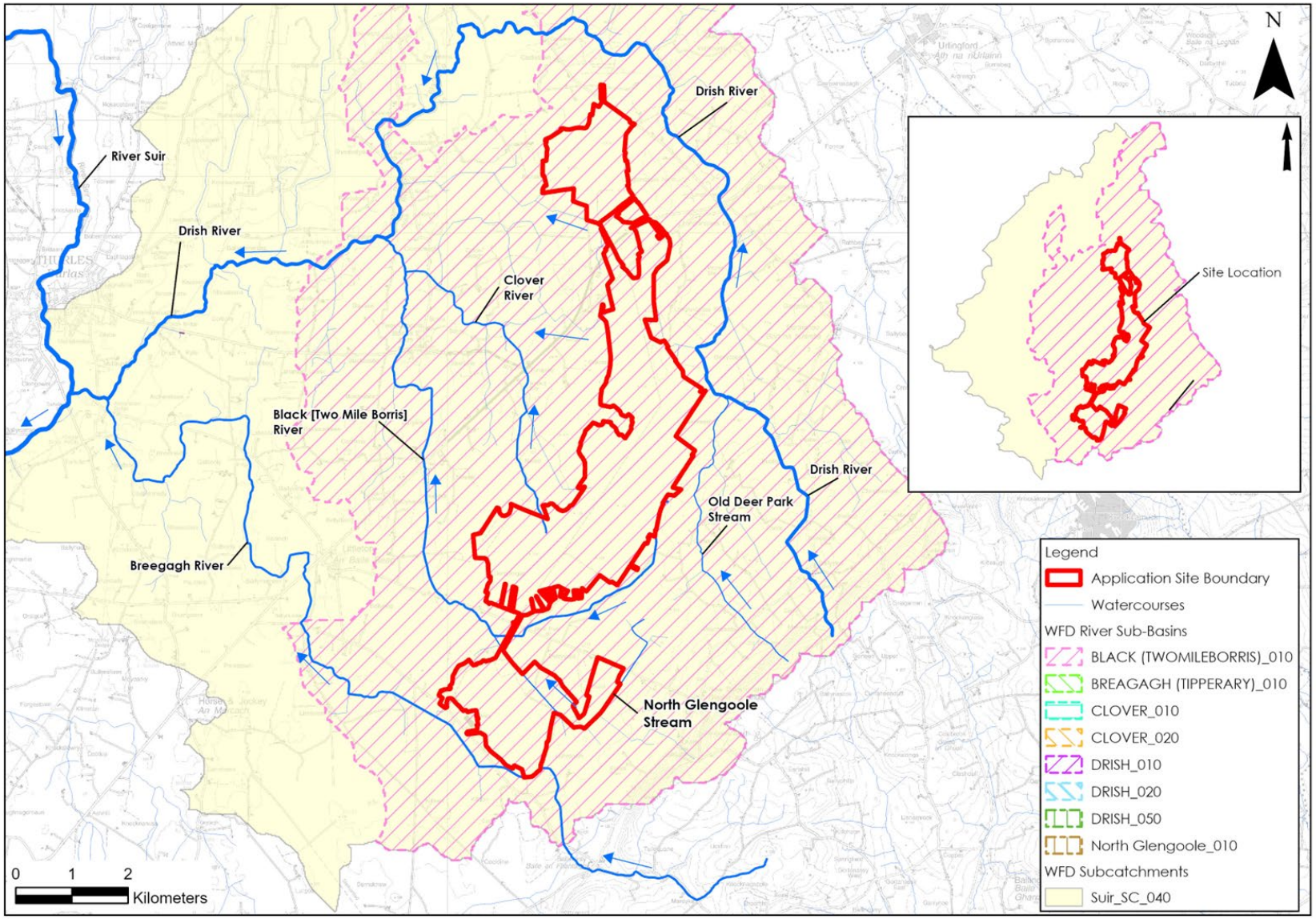

Plate 8-4: Local Hydrology Map

8.4.3 Surface Water Flows

The closest OPW gauging station to the Application Site which records surface water flow volumes is located along the Drish River at Athlummon (Station number: 16001), located approximately 5km to the west of the Application Site. The 95%tile (95th percentile) flow at this station is 0.185m^3/s (185 L/s) (refer to Table 8-8) which means that 95% of the time the flow in the Drish River at this location is greater than or equal to 185 L/s.

Table 8-8: Flow Volumes in the Drish River at Athlummon

Flows Equalled or Exceeded for the Given Percentage of time (m^3/s)								
1%	5%	10%	25%	50%	75%	90%	95%	99%
11.139	6.474	4.738	2.649	1.358	0.69	0.424	0.185	0.079

No OPW gauging stations for which continuous flow data is available are located on the local watercourses (the Clover, Breagagh or Black (Two Mile Borris) rivers) which drain the Application Site.

The EPA's Hydrotool, available on www.catchments.ie, was also consulted in order to estimate the baseline flow volumes in the local area. The Hydrotool dataset contains estimates of naturalised river flow duration percentiles. Several nodes were consulted in the vicinity and downstream of the Application Site to provide an estimate of surface water flow volumes for these local watercourses. Plate 8-5 below presents a flow duration curve for each of the consulted nodes downstream of the Application Site.

As described above a 95%tile flow relates to the flow which will be exceeded within the river 95% of the time. The local watercourses immediately downstream of the Application Site have 95%tile flow volumes less than 0.08m^3/s (80l/s). For example, the Drish River to the south of Longfordpass Bridge has a 95%tile flow volume of 0.072m^3/s (Hydrotool Node: 16_2636) and the Black (Two Mile Borris) River downstream of Twomileborris has a 95%tile flow volume of 0.076m^3/s (Hydrotool Node: 16_4109). The Clover (Hydrotool Node: 16_2399) and Breagagh (Hydrotool Node: 16_4113) rivers have 95%tile flow volumes of 0.049m^3/s and 0.035m^3/s downstream of the Application Site respectively. The flow volumes in the Drish River increase progressively downstream, with the 95%tile flow modelled to be 0.397m^3/s upstream of its confluence with the River Suir (Hydrotool Node 16_525). Flow volumes increase further in the River Suir due to the significantly increased catchment size. Downstream of the Drish River the River Suir has a catchment area of ~438km^2.

Meanwhile, the flow volumes at the outfalls from the Application Site range from 0.01 – 0.1m^3/s. Therefore, based on the above, the waterbodies in the vicinity of the Application Site, with smaller flow volumes, would have had the greatest potential to be impacted by the peat extraction and ancillary activities. The potential for effects decreased progressively downstream due to the dilution effect associated with increasing flow volumes and larger upstream catchment areas. Note that the Development did not in any way rely upon the dilution capacity of any downstream watercourses and that the control measures detailed in Section 8.7 ensured the protection of downstream watercourses.

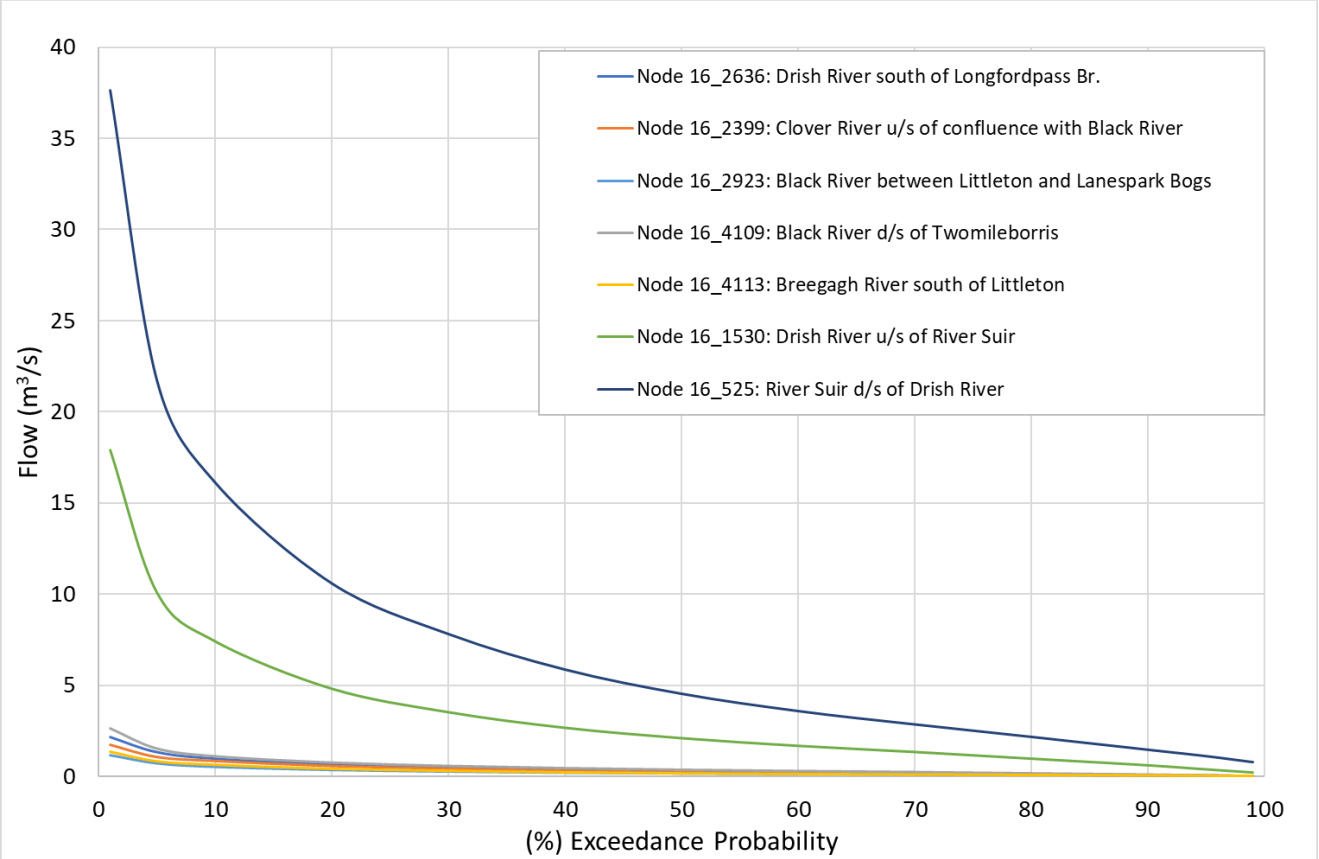

Plate 8-5: EPA Hydrotool Node Flow Duration Curves for Watercourses Downstream of the Application Site

8.4.4 Application Site Drainage

8.4.4.1 Pre-1988 Bog Drainage

Table 8-9 summarises the bog areas, years of drainage and the year that peat extraction first began in the bogs comprising the Application Site.

Drainage ditches to drain the upper surface of the bogs by lowering the local water table were inserted into bogs at different times. Littleton Bog was the first bog to be drained in 1941. Clearance and drainage works commenced at Longfordpass Bog in 1947. Meanwhile, drainage works were undertaken at Lanespark and Derryvella bogs in 1968.

Table 8-9: Peat Extraction Areas, Years of First Drainage and Year of First Peat Extraction

Bog Name	Year of Drainage Insertion	First Extraction Year
Longfordpass Bog	1947	1952
Littleton Bog	1941	1952
Lanespark Bog	1968	1973
Derryvella Bog	1968	1973

Sod Peat Extraction - Drainage Design

Sod peat extraction commenced at the Application Site in 1947 and ceased in 1984.

The drainage for sod peat extraction comprised of the opening of large open drainage ditches, known as "trenches", at approximately 240m across the peat extraction area. The trenches were typically 2m wide and 3 to 4 metres deep. These trenches served as the beginning of the based bank from which sod peat was ultimately extracted. Typically, the large sod peat fields were approximately 700 to 1,800m in length and discharged to the end of the large drainage trenches. Small, piped outfalls were installed perpendicular to the drains where needed to drain low areas that formed along the sod peat field. The pipes used were either concrete or clay pipes with a small diameter of between 150mm and 300mm.

These bogs utilised pumps where levels did not allow for gravity drainage. As the sod peat machine (bagger) was electrically powered a power supply for the pumps was easily obtained from the existing internal distribution network.

The large drainage trenches were continuously maintained using mechanical excavators or draglines and were continuously deepened as sod peat was extracted from the bog to lower the drainage level.

Milled Peat Extraction - Drainage Design

Milled peat was extracted at the Application Site from 1978 and was the only form of peat extracted between 1984 and 2017.

The drainage design for milled peat extraction comprised the insertion of parallel surface water drains, created by machine excavators, at intervals of 15m. Vegetation was then stripped from the bog between these drains to form the peat production fields. The drains were first opened by towing a plough cutting 50cm deep by turning the sod over and as a result, the surface water was removed. After one year the drains were deepened and the spoil removed. This step was repeated for a period of 5-7 years until a stable drain approx. 1.5m deep was established. The fields were then chambered to facilitate rainwater run-off and prevent standing water on the production fields. The drains generally fall towards the headland which is located at both ends of each production field. This headland allows for the plant such as harrowers, millers or ridgers to turn from one field into the next field. The open drains are generally piped across the end of each production field to facilitate peat extraction plant and machinery to travel from field to field. The drainage network continues by either open channel or pipe to a silt pond or ponds prior to discharging from the Bord na Móna site to a local watercourse. The Application Site was primarily drained via gravity however in 1988 12 no. pumps were present in Littleton Bog which assisted drainage once the lower ground levels prevented gravity drainage. 4 no. pumps remain present within Littleton Bog however, none of these are currently active. 1 no. pumping station present was also present at Longfordpass Bog in 1988 baseline.

Silt Ponds

Following the establishment of the Bord na Móna silt committee, it was decided in 1974 to control all effluent by means of specially designed and constructed silt ponds. A copy of the meeting minutes from the Bord na Móna Production Manager in March 1976 setting out the recommendations of the silt committee is included in Appendix 4-8, Volume 3, which directs that "at all milled peat bogs in production, works should carry out surveys and select sites for silt ponds as recommended". Further Bord na Móna records show that silt pond measures were introduced across all Bord na Móna bogs, including the Application Site, in the early to mid-1980s in response to the 1977 Water Pollution Act.

Silt ponds were installed to trap and reduce the emission of suspended solids to surface water bodies originating from activities associated with peat extraction, such as suspended peat particles generated from the production fields and collected in the bog drainage network as well as run-off from workshop areas.

The first silt ponds were constructed at the Application Site prior to 1988, with these ponds being designed with an upper limit of 100mg/l of silt runoff (determined by an An Bord Pleanála decision regarding effluent at Littleton Bog - (refer to Appendix 4-8, Volume 3). The design of silt ponds is detailed in Section 4.3.5.9, with silt ponds typically being 8m in width, 1.5m deep and of variable length. In some locations, baffles have been installed within the ponds to reduce the energy in the flow and elongate the pond thereby increasing residence time and aiding settlement. The inlet and outlet pipes at the silt ponds control the flow velocity, with velocity within the silt pond being less than 0.1m/s. Silt ponds are cleaned twice a year and are all located hydraulically upgradient of discharge/outfall points.

As evidenced in the 1991 Harkins Report (Appendix 4-9, Volume 3), silt control measures in the form of silt ponds were in place prior to 1988, with Bord na Móna carrying out further studies and surveys throughout the 1980s and 1990s to make improvements to how silt ponds operated so that suspended solids emissions in surface run-off were reduced.

8.4.4.2 1988 Baseline Drainage

By 1988 (and the date of the required transposition of the EIA Directive into Irish Law), manmade drainage ditches existed across the Application Site. In essence, the major changes from a hydrological perspective occurred within the bog during the initial drainage, prior to July 1988. Consequently, no major hydrological changes would have occurred following the initial drainage apart from minor alteration of drainage ditches as peat extraction progressed.

Inspection of satellite imagery and Bord na Móna Annual Reports reveal that the Application Site was subject to milled peat extraction by July 1988. The associated drainage to facilitate milled peat extraction was already in situ, with field drains of variable orientation across the Application Site. The bog included 8 no. silt ponds (3 no. on Longfordpass Bog, 4 no. on Lanespark Bog and 1 no. on Derryvella Bog) at the Application Site and 12 no. pumping stations installed at Littleton Bog and 1no. pump installed at Longfordpass Bog. Lanespark, and Derryvella bogs were drained by gravity.

Table 8-10: July 1988 Baseline Drainage

Bog Name	Drainage Type	No. Silt Ponds	No. Pumps
Longfordpass Bog	Milled peat drainage	3	1
Littleton Bog	Milled peat drainage	0	12
Lanespark Bog	Milled peat drainage	4	0
Derryvella Bog	Milled peat drainage	1	0

8.4.4.3 Peat Extraction Phase Drainage (July 1988 - 2017)

As demonstrated above, by July 1988 peat extraction was well established at the Application Site. Drainage was installed in all bogs and railway infrastructure was laid on all bogs as required.

Silt Ponds

Several changes to the on-site bog drainage system occurred during this phase of the Project. These changes were predominantly associated with silt ponds and attempts to reduce the concentrations of suspended sediment being discharged from the bog drainage systems to local surface watercourses. Upgrades to silt ponds were undertaken at the Application Site in the 1990s following the Harkins Internal Bord na Móna Report (1990) which highlighted the issue of elevated suspended sediment concentrations in discharge from the bog drainage network. The report revealed that a total of approximately 50m^3 of sludge per hectare of bog was being discharged to nearby surface watercourses every year (refer to Chapter 4 - Description of Development, Volume 2). Following this, the silt ponds were designed to cater for the settling of sufficient amounts of silt providing the ponds were de-sludged at least twice per annum. A second pond was installed adjacent to the first to facilitate desludging (i.e., used as a backup when the first pond reached silt storage capacity and underwent desludging).

Since 2001, the bog drainage network has been operating in accordance with the existing Integrated Pollution Control licence, with all drainage water from bog units in the licensed area discharged via an appropriately designed silt pond treatment arrangement. The silt ponds serving operation bogs have been sized in accordance with a condition in the existing Integrated Pollution Control Licence (P0499-01) which states:

Within three years of date of grant of this licence all existing silt ponds serving operational bogs shall achieve the following minimum performance criteria (flood periods excepted):

- Maximum flow velocity < 10 cms^{-1}
- Silt design capacity of lagoons, minimum 50m^3 per nett ha of bog serviced

Silt ponds were generally designed and constructed with a width of 8 metres, however, in some cases, silt ponds are up to 12 metres in width. Silt ponds of 12m width are only provided in areas where access is available to both sides of the silt ponds for cleaning. The length of the silt pond will vary depending on the capacity required (i.e. proportional to the area of catchment being drained). In some locations, baffles have been installed within the ponds to reduce the energy in the flow and elongate the pond thereby increasing residence time and aiding settlement. Silt ponds are generally excavated to a depth of 1.5 metres below the pipe invert level, however in some locations, due to restricted space, the silt pond depth is greater than this. Low-velocity flow through the silt pond is generally controlled by inlet and outlet pipes at the silt ponds or upstream of the silt pond. These pipes control the velocity of the flow into and out of the silt ponds so that the velocity within the silt pond itself is less than 0.1 m/sec. The silt ponds are usually cleaned twice a year and are all located hydraulically upgradient of discharge/outfall points.

Pumps

Pumps were active at the Application Site during the Peat Extraction Phase in Littleton Bog and Longfordpass Bog. The pumps supplemented the drainage on site where additional dewatering was deemed necessary as the site could not drain by gravity. Discharges from the pumps would have been to the drainage on site and eventually to the silt ponds for treatment before eventually discharging off site.

8.4.4.4 Current Phase Drainage (2017 - Present)

Drainage of the Application Site and the wider Littleton Bog Group is currently operating under licence from the EPA (P0499-01). The drainage system has been operating in accordance with this existing Integrated Pollution Control licence, with all drainage water being discharged from the bogs passing through an appropriately designed silt pond treatment arrangement prior to discharge.

Currently surface water (or runoff water) is drained from the Application Site via a network of field drains typically spaced at 15m intervals, piped drains, main drains, headland drains, and silt ponds. The silt ponds were used to trap sediment and prevent elevated levels of suspended sediment arising in effluent from the drained peatland. Treated surface water is then discharged at outfall points where the effluent flows into off-site drainage channels which in turn discharge into the local stream and river network.

A flow diagram of the existing drainage system is shown in Plate 8-6 below.

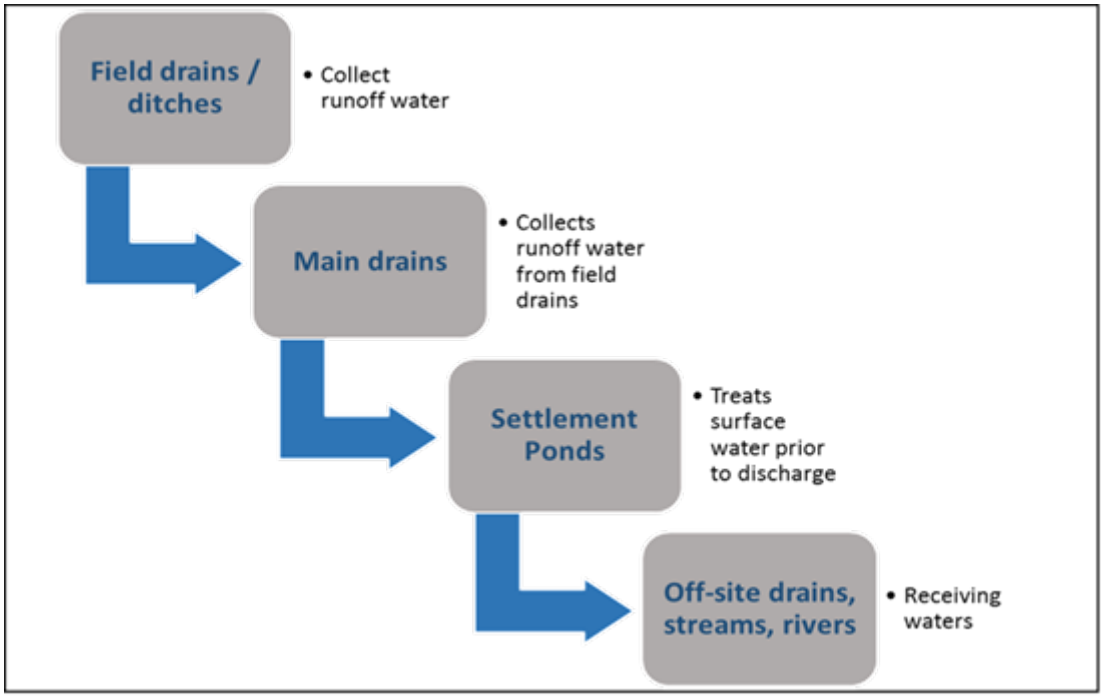

Plate 8-6: Process Flow Diagram for the Site Drainage Network

A detailed hydrological audit of flowpaths for the Application Site to its eventual discharge point at the regional catchment scale was completed for the Application Site (refer to Plate 8-7).

Drainage from the Application Site currently discharges through several gravity surface water outfalls and the locations of these outfalls and the receiving surface waterbodies are detailed below and in the Planning Drawings accompanying this Application. There is currently no discharge to surface waters at Littleton Bog.

There are currently 2 no. outfalls from Longfordpass Bog. A settlement pond located in the north of the bog, discharges to a small stream which is not included on the EPA database but is shown on the local 6" and 25" base mapping. This stream flows to the north for ~600m before it discharges into the Drish River. A second settlement pond is located in the southwest of Longfordpass Bog and discharges to a small stream which is mapped along the western boundary of the bog. This stream is not assigned a name by the EPA, flows to the west and discharges into the Drish River ~4.8km downstream of the Application Site.

The drainage network in Littleton Bog is of variable orientation, with northeast to southwest orientated drains in the main bog area and northwest to southeast orientated drains in the northern section of the bog. Drainage of this bog was historically facilitated by several pumping stations as the previous peat extraction and ancillary activities resulted in the bog being unable to drain by gravity due to the lowered ground elevations. The pumping stations were located in the west of Littleton Bog and discharged to small streams which merge downstream to form the Clover River. However, these pumping stations are no longer active. There remains 1 no. outfall to the Clover River which is drained by gravity. Water in much of the bog area is directed towards this outfall and also pools in some of the lower lying peat fields and deeper drains which act as large settlement ponds. This water may slowly recharge to ground in localised areas where the underlying glacial deposits are more porous. However, any groundwater recharge is likely very limited, as the ponded areas remain extensive in summer and during dry periods indicating little recharge to ground. It is also noted that some small areas in the northeast of Littleton Bog drain by gravity and discharge to local drains and small watercourses to the east of the bog. These features are hydrologically connected with the Drish River.

Lanespark Bog is drained by field drains of northwest to southeast orientation. Drainage within the bog is directed to several settlement ponds located around the perimeter of the bog. In the north a settlement pond discharges to a local drain which in turn discharges to the North Glengoole Stream. To the south, 2 no. settlement ponds discharge to local drains which are hydrologically connected to the Breagagh River which flows to the south of the bog.

Derryvella Bog contains field drains of variable orientation. Drainage rom this bog discharges via settlement ponds to the North Glengoole Stream which flows to the northwest between Derryvella and Lanespark bogs. This stream discharges into the Black (Two Mile Borris) River.

All watercourses draining the Application Site eventually discharge into the Drish River and the River Suir further downstream.

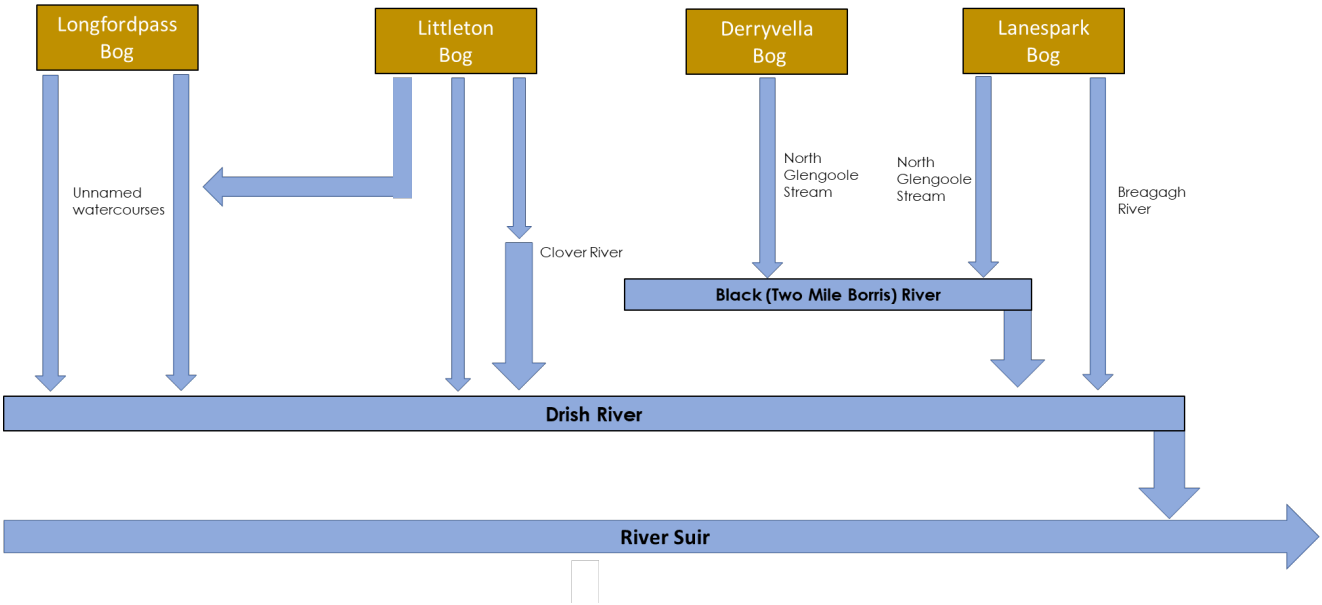

Plate 8-7: Hydrological Flowpaths for the Application Site

8.4.5 Summary Flood Risk Assessment

This section provides a summary of the Flood Risk Assessment (FRA) undertaken for the Application Site. the full FRA is provided in Appendix 8-1, Volume 3.

To identify those areas as being at risk of flooding, OPW's River Flood Extents Map, the National Indicative Fluvial Mapping, Past Flood Event Mapping (www.floodinfo.ie) and historical mapping (i.e. 6" and 25" base maps) were consulted.

No recurring flood incidents or instances of historical flooding were identified within the Application Site on historic OS maps. Identifiable map text on local available historical 6" or 25" mapping for the Application Site does not identify any lands that are "liable to flood".

Based on the EPA/GSI soil map for the area no regions of alluvium are mapped within the Application Site boundaries. However, some alluvium (fluvial deposits) is recorded along many of the local streams and rivers downstream of the Application Site.

The OPW Past Flood Events Map has no records of historic or recurring flood events within the Application Site. The closest mapped recurring flood event to the Application Site is located ~1.9km west of Littleton Bog (Flood ID: 4373) at Garryclogh. Here a local road is reported to flood approximately every 2 years, with surface water runoff listed as the source of the flooding. A recurring flood event is also mapped ~2.5km west of Lanespark Bog (Flood ID: 3759) at Ballymurreen Bridge, associated with flooding of the Breagagh River. Further downstream recurring flood events are also recorded on the Drish River (Flood ID: 3752) and the River Suir (Flood ID: 3748) in the vicinity of Thurles. The OPW also record several historic flood events, several of which date from 2012 and are mapped to the east of Littleton Bog along the Drish River.

The GSI's Winter 2015/2016 Surface Water Flood Map shows surface water flood extents for this winter flood event. This flood event is recognised as being the largest flood event on record in many areas. This flood map shows several areas of surface water ponding within the Application Site. These flood zones correspond with large areas of surface water ponding which were recorded during the site walkover surveys.

Where complete, the CFRAM OPW Flood Risk Assessment Maps are now the primary reference for flood risk planning in Ireland and supersede the PFRA maps. No CFRAM mapping has been completed for the area of the Application Site. The closest mapped CFRAM fluvial flood zones are located along the River Suir near Thurles, ~8.7km west of the Application Site.

The National Indicative Fluvial Flood Map (NIFM) for the Present-Day Scenario records some flood zones within the northern section of Lanespark Bog. These modelled flood zones are associated with Black (Two Mile Borris) River and a small tributary which runs along the northern boundary of the bog (North Glengoole Stream). However, these flood zones do not encroach significantly upon the Application Site. Existing watercourse crossings (large diameter culverts) exist at these locations where the Bord na Móna railway line, and an adjacent machine pass, cross these watercourses. NIFM fluvial flood zones are also mapped along the Drish River to the northeast of Littleton Bog. However, these flood zones do not encroach upon the Application Site.

Furthermore, the Application Site is not mapped within any historic or modelled groundwater flood zones.

The main risk of flooding is via pluvial flooding due to the low permeability of the peat soils and subsoils. Site walkover surveys indicate that the surface of the cutover bog contains an extensive network of peat drains with surface water outflows from the bog. This existing drainage network has been reduced the risk of pluvial flooding across much of the Application Site. However, following periods of intense or prolonged rainfall localised surface water ponding is still likely to occur. Surface water ponding occurs in the centre of Littleton Bog as this bog no longer discharges to surface watercourses since with pumping stations have been inactive.

8.4.6 Surface Water Quality

8.4.6.1 EPA Biological Q-Rating Monitoring

The Biological Q-Rating is a water quality rating system based on both the habitat and the invertebrate community assessment and is divided into status categories ranging from 0-1 (Poor) to 4-5 (Good/High). EPA Q-rating monitoring (i.e. biological monitoring data) of river waterbodies began in the early 1970s and continues to the present day. The results of this monitoring provides an indication of water quality trends in the streams and rivers downstream of the Application Site.

8.4.6.1.1 Pre-July 1988

Prior to July 1988, historic Q-data is available from 1974 to 1985 for the Breagagh, Black and Drish rivers in the vicinity and downstream of the Application Site. No Q-ratings are available for the Clover River. Table 8-11 shows that the historic Q-values ranges from Poor Q-status (Q3) to High Q-status (Q4-5) during this time period.

The Breagagh River directly upstream of the Application Site (Station Code: RS16B030100) achieved Poor Q-status in both 1981 and 1985. Downstream of the Application Site at Lahardan Bridge (Station Code: RS16B030300), the Breagagh River saw an improvement in status from Moderate Q-status (Q3-4) in 1981 to Good Q-status (Q4) in 1984. The status of the Black (Two Mile Borris) River fluctuated between Poor and Moderate Q-status between 1980 and 1985 at a bridge west of Twomileborris (Station Code: RS16B010100). The status of the Drish River deteriorated from High Q-status at Boolabeha Bridge (Station Code: RS16D020100) and Drish Bridge (Station Code: RS16D020300) in the 1970s to Good Q-status in 1983. Good Q-status was also achieved in 1983 at a bridge south of Athlummon (Station Code: RS16D020200) and upstream of the River Suir (Station Code: RS16D020400).

Table 8-11: EPA Q-Rating Status (Pre-1988)

River	Station ID	Location	EPA Q-Ratings
Breagagh River	RS16B030100	Bridge 1 km S.S.W. of Littleton	1981, 1985 - Q3
	RS16B030300	Lahardan Bridge	1981 - Q3-4
			1984 - Q4
	RS16B030400	Bridge u/s Drish River Confluence	1981, 1985 - Q4
Black River	RS16B010100	Bridge W of Twomileborris	1980 - Q3
			1982 - Q3-4
			1985 - Q3
Drish River	RS16D020100	Boolabeha Bridge	1974 - Q4-5
			1980, 1983 - Q4
	RS16D020200	Bridge S of Athlummon	1980 - Q3
			1983 - Q4
	RS16D020300	Drish Bridge	1977 - Q4-5
			1980, 1983 - Q4
	RS16D020400	Bridge u/s River Suir	1980, 1983 - Q4

8.4.6.1.2 July 1988 Baseline

Biological Q-rating data is available for 1988 at most EPA monitoring locations in the vicinity and downstream of the Application Site. The baseline Q-rating data is presented in Table 8-12 below.

Upstream of the Application Site, the Breagagh River achieved a Moderate Q-status (Station Code: RS16B030100). Downstream of the Application Site and 1km southwest of Littleton (Station Code: S16B030200) the Breagagh River also achieved Moderate Q-status. Further downstream at Lahardan Bridge (Station Code: RS16B030300), the Breagagh River achieved High Q-status. The Black (Two Mile Borris) River achieved Good Q-status at 3 no. monitoring locations downstream of the Application Site. Meanwhile, the Clover River achieved Poor Q-status at Turnpike Bridge (Station Code: RS16C040100) and Moderate Q-status upstream of its confluence with the Black (Two Mile Borris) River (Station Code: RS16C040300). The status of the Drish River ranged from Moderate Q-status at Longfordpass Bridge (Station Code: RS16D020050) to High Q-status at Boolabeha Bridge (Station Code: RS16D020100). All other stations on the Drish River were of Good Q-status.

Table 8-12: EPA Q-Rating Status (July 1988 Baseline)

River	Station ID	Location	EPA Q-Ratings
Breagagh River	RS16B030200	Bridge 1 km S.S.W. of Littleton (Bog)	Q3-4
	RS16B030100	Bridge 1 km S.S.W. of Littleton	Q3-4
	RS16B030300	Lahardan Bridge	Q4-5
	RS16B030400	Bridge u/s Drish River	Q4
Black River	RS16B010100	Bridge W of Twomileborris	Q4
	RS16B010090	Bridge W of Newhill	Q4
	RS16B010200	Just u/s Drish River confluence	Q4
Clover River	RS16C040100	Bridge at Turnpike	Q2
	RS16C040300	Bridge u/s Black River	Q3-4
Drish River	RS16D020050	Longfordpass Bridge	Q3-4
	RS16D020070	Bridge NE of Castletown	Q4
	RS16D020100	Boolabeha Bridge	Q4-5
	RS16D020200	Bridge S of Athlummon	Q4
	RS16D020300	Drish Bridge	Q4
	RS16D020400	Bridge u/s River Suir	Q4

8.4.6.1.3 Peat Extraction Phase (July 1988 - 2017)

EPA Q-monitoring has been completed throughout the Peat Extraction Phase on all watercourses in the vicinity and downstream of the Application Site. The Q-values during this period are summarised in Table 8-13 and more detailed are presented graphically in Plate 8-9.

Only 1 no. round of monitoring was completed on the Breagagh River in 1992. The Breagagh River achieved Moderate Q-status downstream of the Application Site (Station Code: RS16B030200) and Good Q-status further downstream at Lahardan Bridge (Station Code: RS16B030300).

Several rounds of monitoring were completed at numerous different locations along the Black (Two Mile Borris) River during the Peat Extraction Phase. During this time period the status of this river was typically of Moderate to Good Q-status. No High Q-status was achieved whilst Poor Q-status was achieved at 2 no. locations in 2002 at Black River Bridge (Station Code: RS16B010030) and a Bridge West of Newhill House (Station Code: RS16B010090).

The status of the Clover River at Turnpike Bridge (Station Code: RS16C040100) ranged from Bad Q-status in 1996 to Poor Q-status across several rounds from 2002 to 2017. Further downstream, and upstream of its confluence with the Black (Two Mile Borris) River, the status of the Clover River ranged from Poor Q-status in 1996 to Good Q-status across several rounds from 1999 to 2014.

The lowest Q-status on the Drish River was Poor Q-status recorded at a Bridge NE of Castletown (Station Code: RS16D020070) in 1999 and 2002. The status at this location improved to Poor Q-status in subsequent monitoring rounds during the Peat Extraction Phase. Elsewhere the status of the Drish River typically fluctuated between Poor and Good Q-status.

Table 8-13: EPA Q-Rating Status During the Peat Extraction Phase

River	Station ID	Location	No. Rounds (Years)	Q-Status Range
Breagagh River	RS16B030200	Bridge 1 km S.S.W. of Littleton (Bog)	1 (1992)	Q3-4
	RS16B030300	Lahardan Bridge	1 (1992)	Q4
	RS16B030400	Bridge u/s Drish River	1 (1992)	Q4
Black River	RS16B010100	Bridge W of Twomileborris	7 (1992 - 2014)	Q4
	RS16B010030	Black River Bridge	6 (1996 - 2014)	Q3 - Q4
	RS16B010090	Bridge W of Newhill	5 (1992 - 2005)	Q3 - Q4
	RS16B010200	Just u/s Drish River	1 (1992)	Q4
Clover River	RS16C040100	Bridge at Turnpike	10 (1989 - 2014)	Q1 - Q3
	RS16C040300	Bridge u/s Black River	8 (1992 - 2014)	Q2-3 - Q4
Drish River	RS16D020070	Bridge NE of Castletown	6 (1992 - 2014)	Q2/0 - Q4.5

River	Station ID	Location	No. Rounds (Years)	Q-Status Range
	RS16D020100	Boolabeha Bridge	8 (1992 - 2014)	Q3 - Q4
	RS16D020040	Bridge u/s Longfordpass Bridge	7 (1996 - 2014)	Q3 - Q3-5
	RS16D020200	Bridge S of Athlummon	8 (1992 - 2014)	Q3 - Q4
	RS16D020300	Drish Bridge	1 (1992)	Q4
	RS16D020400	Bridge u/s River Suir	8 (1992 - 2014)	Q3 - Q4

8.4.6.1.4 Current Phase (2017 to Present)

The EPA Q-ratings during the Current Phase are shown in Table 8-14 below. The EPA monitoring locations and the most recent Q-ratings are presented in Plate 8-10.

No Q-ratings are available on the Breagagh River for the Current Phase. The Black (Two Mile Borris) River experienced a deterioration in Q-status from Good Q-status in 2017 to Poor Q-status in 2023. The Clover River was of Poor Q-status at Turnpike Bridge throughout this phase, and experienced a deterioration in status upstream of its confluence with the Black River from Moderate Q-status in 2020 to Poor Q-status in 2023. Meanwhile, the Drish River was generally of Poor to Moderate Q-status during this phase.

Table 8-14: EPA Q-Rating Status During the Current Phase

River	Station ID	Location	EPA Q-Ratings
Black River	RS16B010100	Bridge W of Twomileborris	2017 - Q4
			2020 - Q3.5
			2023 - Q3
Clover River	RS16C040100	Bridge at Turnpike	2017, 2020, 2023 - Q3
	RS16C040300	Bridge u/s Black River	2017, 2020 - Q3-4
			2023 - Q3
Drish River	RS16D020070	Bridge NE of Castletown	2017, 2020, 2023 - Q3
	RS16D020100	Boolabeha Bridge	2020 - Q3
			2023 - Q3-4
	RS16D020040	Bridge u/s Longfordpass Bridge	2017, 2020, 2023 - Q3
	RS16D020200	Bridge S of Athlummon	2017, 2020 - Q3
			2023 - Q4
	RS16D020400	Bridge u/s River Suir	2017 - Q4
			2020, 2023 - Q3-4

Plate 8-8: Historic Q-ratings in local watercourses

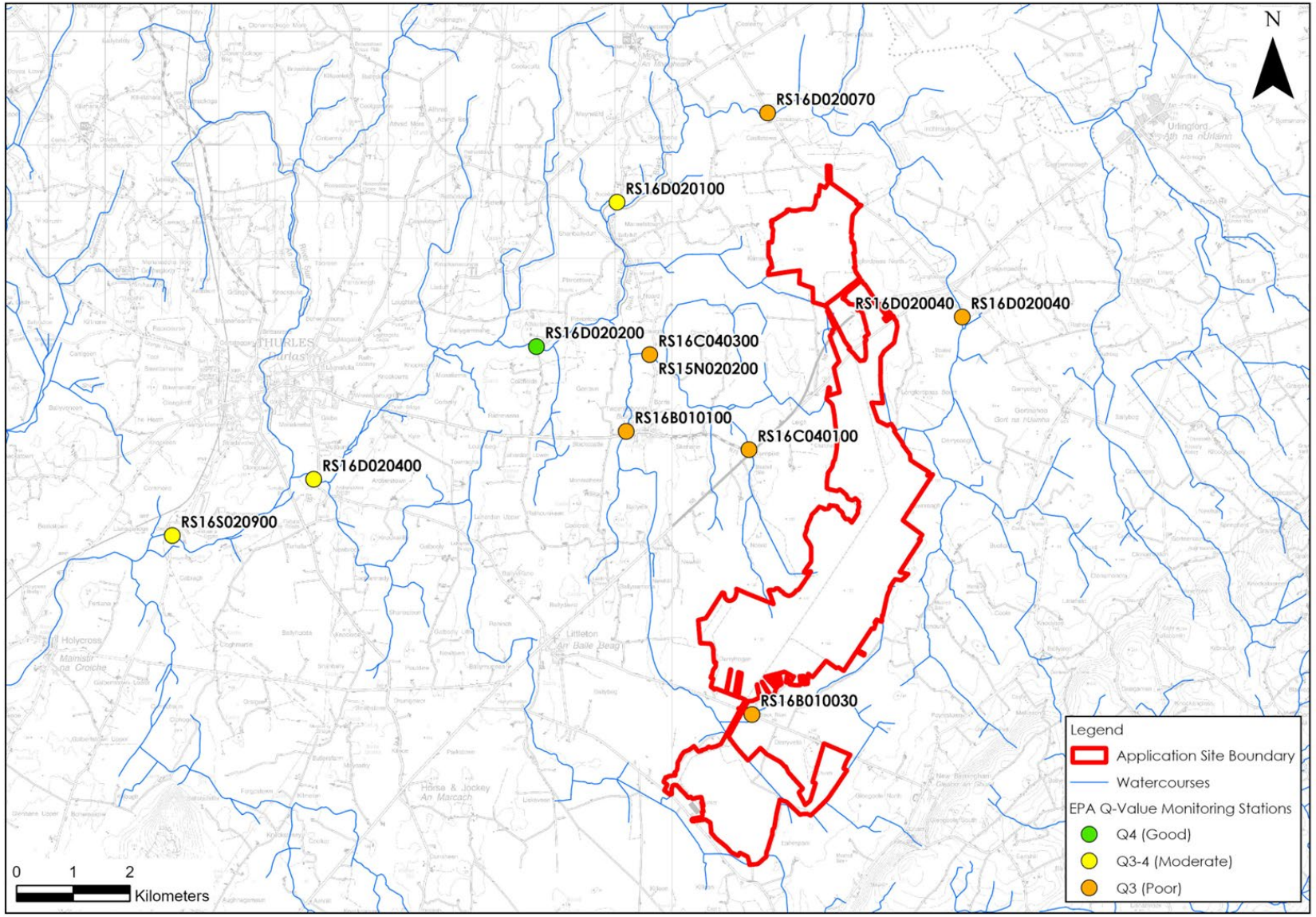

Plate 8-9: EPA Q-Monitoring Stations

8.4.6.2 Triturus - Biological Monitoring

Triturus Environmental Ltd completed baseline aquatic monitoring on watercourses downstream of the Application Site in September and October 2023 (Triturus, 2024). The aquatic surveys included a total of 30 no. survey locations downstream of the Application Site. The report is included as Appendix 6-2, Volume 3 of this rEIAR.

The study found that 1 no. monitoring site on the Drish River achieved 'Good' status. 3 no. locations downstream of the Application Site achieved 'Moderate' status (Drish River and the Breagagh River (2 no. sites). All other locations were found to be of 'Poor' status.

The aquatic baseline report concludes that at the majority of monitoring locations the biological water quality was unsatisfactory and was not meeting the Good status targets. However, the report also notes that low summer flows also influenced the September 2023 monitoring.

8.4.6.3 EPA Long-Term Water Quality Monitoring

HES has reviewed the available water quality monitoring data, completed in accordance with the requirements of the Water Framework Directive, for the waterbodies in the vicinity and downstream of the Application Site. The data is available for download at https://www.catchments.ie/data.

EPA monitoring began on the watercourses in the local area in 2007, during the later part of the Peat Extraction Phase and continues to the present day. Note that data is not available to download for all watercourses in the vicinity of the Application Site. Table 8-15 below presents summary data of the water quality monitoring with respect to BOD, ortho-phosphate and ammonia and presents the results alongside the relevant EQS as set out in S.I. 272/2009. The results are also presented graphically for these parameters in Plate 8-10, Plate 8-11 and Plate 8-12, and are summarised as follows:

- With respect to ortho-phosphate, the mean concentration from 2007-2017 during the Peat Extraction Phase was of Good status (≤0.035mg/l) in the Breagagh (Tipperary)_010, the Drish_020 and Drish_050 SWBs. Meanwhile, the Black(Twomileborris)_010 SWB was of High status (≤0.025). During the Current Phase (2017-Present) the Black(Twomileborris)_010 and the Drish_0202 SWBs achieved High status with respect to ortho-phosphorus concentrations. The Clover_010 and Drish_050 SWBs exceeded the Good status threshold.
- With respect to BOD, the mean concentrations in all of the consulted waterbodies exceeded the Good status threshold of ≤1.5mg/l during both the Peat Extraction Phase and the Current Phase with the exception of the Black(Twomileborris)_010 SWB which achieved Good status during the later stages of the Peat Extraction Phase.
- With respect to ammonia, the mean concentrations in all of the consulted waterbodies exceeded the Good status threshold of ≤0.065mg/l during the later part of the Peat Extraction Phase. During the Current Phase, the mean concentrations were found to be of Good status in the Breagagh (Tipperary)_010, and Black(Twomileborris)_010 the Drish_020 SWBs.

Suspended solid concentrations have not been monitored continuously across many of the SWBs in the vicinity and downstream of the Application Site. However, the available data indicates that concentrations of suspended solids are well below the 25mg/l ELV.

Table 8-15: EPA Water Quality Monitoring Data Summary

River Waterbody	Parameter	Status Threshold (S.I. 272/2009)	Mean Peat Extraction Phase (2007-2017)	Mean Conc. Current Phase (2017-Present)
Clover_010	Ortho-P	High ≤0.025, Good ≤0.035	N/A	0.08
	BOD	High ≤1.3, Good ≤1.5	N/A	2.43
	Total Ammonia	High ≤0.04, Good ≤0.065	N/A	0.27
Breagagh (Tipperary)_010	Ortho-P	High ≤0.025, Good ≤0.035	0.035	0.030
	BOD	High ≤1.3, Good ≤1.5	1.68	1.62
	Total Ammonia	High ≤0.04, Good ≤0.065	0.112	0.057
Black (Twomileborris)_010	Ortho-P	High ≤0.025, Good ≤0.035	0.022	0.022
	BOD	High ≤1.3, Good ≤1.5	1.41	1.76
	Total Ammonia	High ≤0.04, Good ≤0.065	0.071	0.044
Drish_020	Ortho-P	High ≤0.025, Good ≤0.035	0.033	0.018
	BOD	High ≤1.3, Good ≤1.5	2.03	1.61
	Total Ammonia	High ≤0.04, Good ≤0.065	0.187	0.062
Drish_050	Ortho-P	High ≤0.025, Good ≤0.035	0.031	0.051
	BOD	High ≤1.3, Good ≤1.5	1.61	2.48
	Total Ammonia	High ≤0.04, Good ≤0.065	0.083	0.31

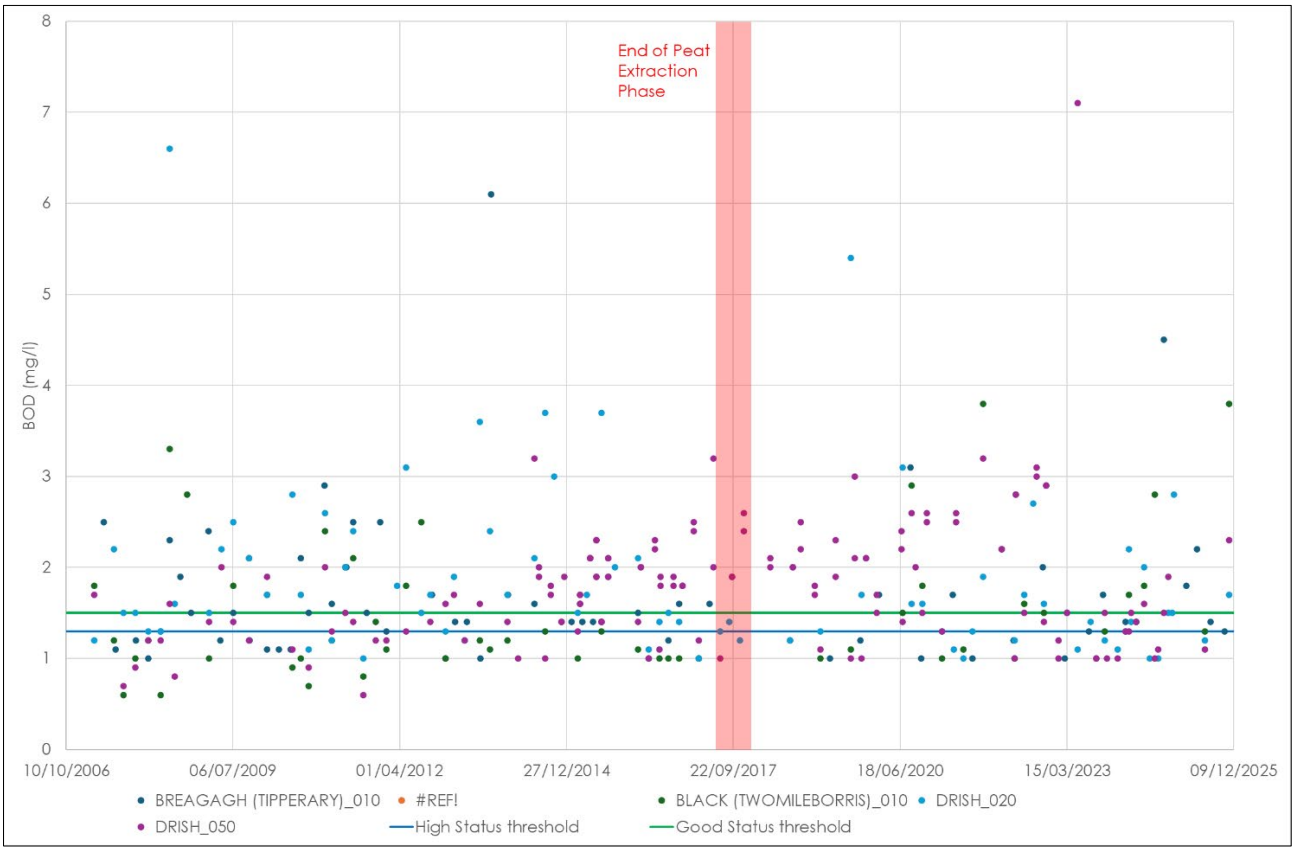

Plate 8-10: WFD Water Quality Monitoring (BOD)

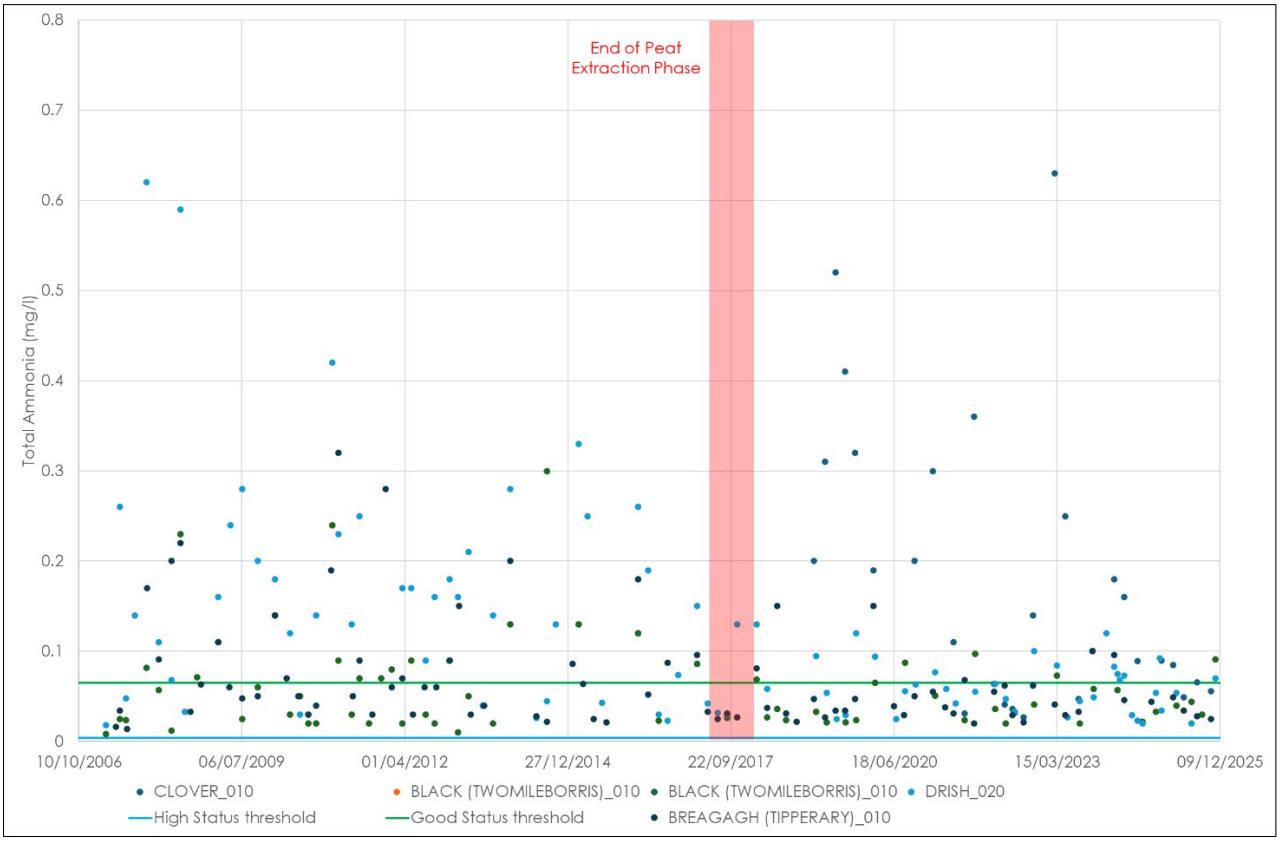

Plate 8-11: WFD Water Quality Monitoring (Total Ammonia)

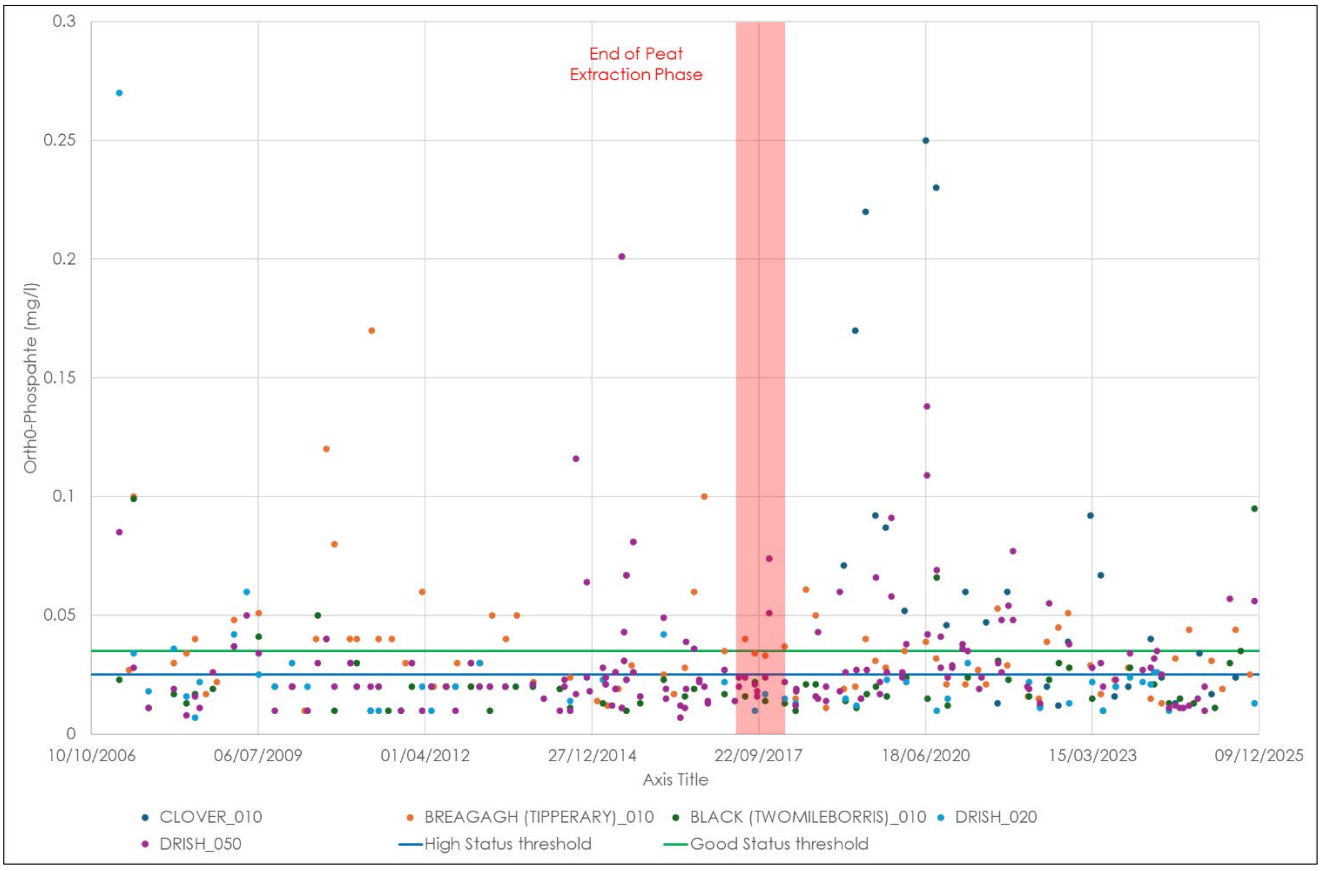

Plate 8-12: WFD Water Quality Monitoring (Ortho-Phosphate)

8.4.6.4 Bord na Móna Monitoring

8.4.6.4.1 Pre-2001

Before the implementation of the IPC Licence requirements and associated monitoring discussed below, limited monitoring of surface water quality and emissions was completed at the Application Site by the Applicant.

However, as discussed in Chapter 4 - Description of the Development, Volume 2 several mitigation measures designed to protect surface water quality were in place prior the IPC Licence. These measures related to the storage and maintenance of vehicles, refuelling procedures, the maintenance of internal drains, pumps and waste management. No records of surface water quality monitoring exist from this time period.

Silt ponds were constructed at the Application Site in the mid-1980s, with no water/silt control measures present before this date. These silt ponds were constructed with an upper design limit of 100mg/l of suspended sediment.

8.4.6.4.2 IPC Licence Monitoring (2001-Present)

The Applicant has been conducting monitoring of emissions to water from the Littleton Bog Group from 2001 to the present as set out in IPC Licence P0499-01. Condition 6 ensures the Applicant establishes a surface water discharge monitoring programme which is reviewed annually and a report submitted to the EPA quarterly. The Applicant is also required to submit water sample results annually, implement and maintain silt ponds. Condition 9 pertains to the 'Water Protection' and outlines the weekly, monthly, quarterly, and annual inspections Bord na Móna must carry out to provide for the protection of surface and groundwater.

This monitoring included monitoring of outfalls at the Application Site as well as outfalls from several bogs in the wider Littleton Bog Group which do not form part of the Application Site. The monitoring locations were rotated each year between different bogs which comprise the Littleton Bog Group. Annual Environmental Reports (AERs) are available for the Littleton Bog Group between 2002 and 2024 (no data is available for 2019, 2020 or 2021).

Stormwater (i.e. rainwater run-off from roof and non-process areas such as carparks) derived on-site is released into a local waterbody following basic treatment. The IPC licence requires that stormwater (from roof and non-process areas such as carparks) is managed to ensure that no pollutants are released into the receiving environment. Where run-off comprises of only roof water it is directed directly to a drain. Runoff from other areas such as carparks is passed through a hydrocarbon interceptor before discharge. Discharges (from roof and non-process areas such as carparks) are inspected and sampled on a monthly basis. The primary treatment criteria used to define adequate treatment of stormwater is COD mg/l. Monthly sampling was completed with results being generally well below the COD trigger levels.

The IPC licence has also required that process water (surface water runoff) at the Application Site be managed to ensure no pollution results when waters are discharged into local surface waterbodies. Two types of wastewaters were produced at the Application Site: process water which is surface water runoff from the activities associated directly with peat extraction operations, and sanitary effluent from toilets and canteens. All process water from peat extraction areas is treated via a silt pond drainage system which has been inspected and maintained in accordance with Condition 6 of the IPC Licence (P0499-01). Treated process water is released into the Clover, Drish, Black (Two Mile Borris) and the Breagagh rivers. IPC Licence requirements comprise of quarterly grab samples on a select number of silt pond outlets across the Littleton Bog Group.

From the available AERs it can be deduced that a maximum of 253 no. grab samples have been taken at the outfalls from the Application Site. Note that the format of the AERs vary from year to year, with some years specifically detailing the outfalls which were sampled whilst others only provide the total number of samples obtained across the Littleton Bog Group. For the years where the precise sampling locations are available, only those within the Application Site were consulted, whilst for other years which do not specify the sampling locations all sample results listed in the AERs were consulted.

The samples have been analysed for COD, pH, Ammonia, Total Phosphorous, Suspended Solids, Total Solids and Colour. The Emission Limit Values (ELVs) are 35mg/l suspended solids, 4mg/l total ammonia, and 100mg/l COD. From the 253 no. samples consulted, 98% were compliant with respect to suspended solids, 92% were compliant with respect to COD whilst no exceedances of the ELV were recorded for ammonia. The exceedances for suspended solids are outliers and generally occurred in the early years of the IPC licence, and following housekeeping and improvements to silt control, the concentrations of suspended solids have generally been compliant. For example, only 1 no. exceedance has been recorded for suspended solids since 2010.

Incidents Reporting

The available AERs were also consulted for any records of environmental complaints or incidents. No water related complaints were recorded in recent AERs. The most recent complaint was recorded in the 2014 AER and related to flooding on lands adjacent to the Application Site. The AER states that Bord na Móna addressed this issue by cleaning the appropriate outfall. Other complaints recorded in earlier AERs included silt being recorded in the Drish River in 2004 and in the Black and Clover rivers in 2003. These complaints relating to silt occurred during the early stages of the IPC licence and no complaints relating to silt have been recorded since 2004.

In relation to water-related environmental incidents, the AERs note the breach of the ELVs when they occurred which primarily related to COD concentrations. Spillages were also recorded in the 2018, 2014, 2008 and 2006 AERs. Note that these spillages were recorded within the wider Bog Group, which is covered by the IPC Licence, with the reports not specifying which exact bog the spill occurred in. These AERs state that these were minor spillages and that remediation actions were taken by remediation companies and preventative actions were undertaken to prevent similar accidents happening in the future.

8.4.7 Hydrogeology

The Application Site is underlain by a total of 5 no. bedrock geological formations. Much of the northern section of Littleton Bog is underlain by the Ballysteen Formation which consists of dark muddy limestones and shales. The south of Littleton Bog, the west of Lanespark Bog and the majority of Longfordpass Bog are underlain by the Waulsortian Limestones, comprising of massive, unbedded lime-mudstones. A small area in the northwest of Longfordpass Bog and a small area of Lanespark Bog are underlain by the Crosspatrick Formation which consists of pale-grey cherty crinoidal limestones. The southeast of Lanespark Bog and Derryvella Bog are underlain by the Aghmacart Formations, comprising of dark shaly micrite, peloidal limestone. A small area in the northeast of Littleton Bog is underlain by the Lisduff Oolite Member consisting of oolitic limestone.

The GSI classify the Waulsortian Limestones as a Regionally Important Aquifer - Karstified. The Ballysteen and Aghmacart Formations are classified as Locally Important Aquifers - Bedrock which is Moderately Productive only in Local Zones. The Crosspatrick Formation and the Lisduff Oolite Member are classified as Locally Important Aquifers - Bedrock which is Generally Moderately Productive. A bedrock aquifer map is included as Plate 8-13.

In terms of Groundwater Bodies (GWBs) the Application Site is underlain by the Templemore and Thurles GWBs.

According to the GSI's GWB characterisation report for the Templemore GWB (GSI, 2003), this GWB extends from Templemore towards Tipperary town. This area is very low lying with the River Suir meandering through a wide valley. To the east of the River Suir topographic gradients are low. The GSI state that there is a major NNW-SSE fault complex in the area and a large syncline which runs between Twomileborris and Thurles. Diffuse recharge will occur to this GWB where subsoils are thinnest and most permeable. There are also several karst features which provide point recharge to this GWB. The GSI state that the key sources of data used to estimate the aquifer characteristics are based on data from the Karst aquifer and are not representative of the whole GWB which also contains Silurian and Devonian rocks. However, karst aquifers do underlie this section of the Application Site. The permeability in the aquifers depends on the development of faults, fissures and fractures. Regionally the groundwater flow direction is towards the River Suir and its tributaries. Groundwater flow in the karst aquifer is confined to conduits, which have developed by the dissolution of fissures. The nature of the karst hydrogeology will be ultra variable even on a local scale. Groundwater flow in these conduits will be fast. Discharge occurs via springs, which flow towards the surface water bodies or via baseflow directly into the rivers.

The Thurles GWB is located northeast of Thurles. This area is exceptionally flat but with few rivers. This GWB is comprised largely of Regionally Important fractured aquifer and a Locally Important Aquifer. Most groundwater recharge will occur where the rock is close to the surface. Groundwater flow in the aquifer is likely towards the southwest and discharges as a series of large springs (GSI, 2003).

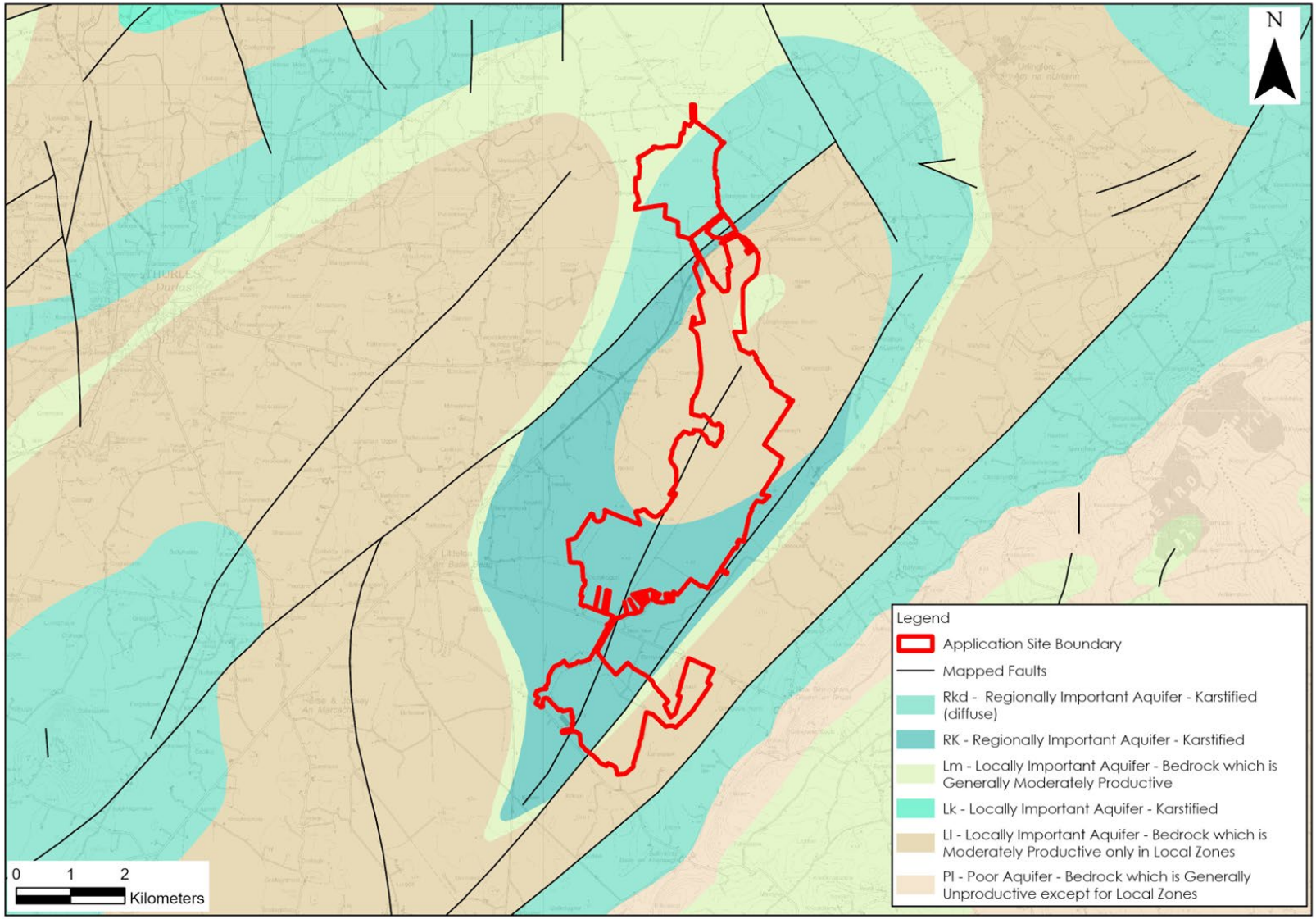

Plate 8-13: Bedrock Aquifer Map

8.4.8 Karst Features

Karst features are mapped by and are available through the GSI online viewer (www.gsi.ie). A map of local karst features is included as Plate 8-14.

There are no karst features mapped within the Application Site due to the coverage of peat and glacial subsoils. However, there are several karst features mapped in the surrounding lands. Mapped karst features within 5km of the Application Site include:

- 2 no. swallow holes in the townland of Poyntstown, ~1.5km east of the Application Site.
- 2 no. swallow holes are also mapped ~3.2km to the west of the Application Site in the townland of Ballymurreen.
- A clay infilled fissure was recorded in a boreholes ~4.3km to the south of the Application Site.
- An enclosed depression is location ~4.4km northeast of the Application Site in the townland of Urard.

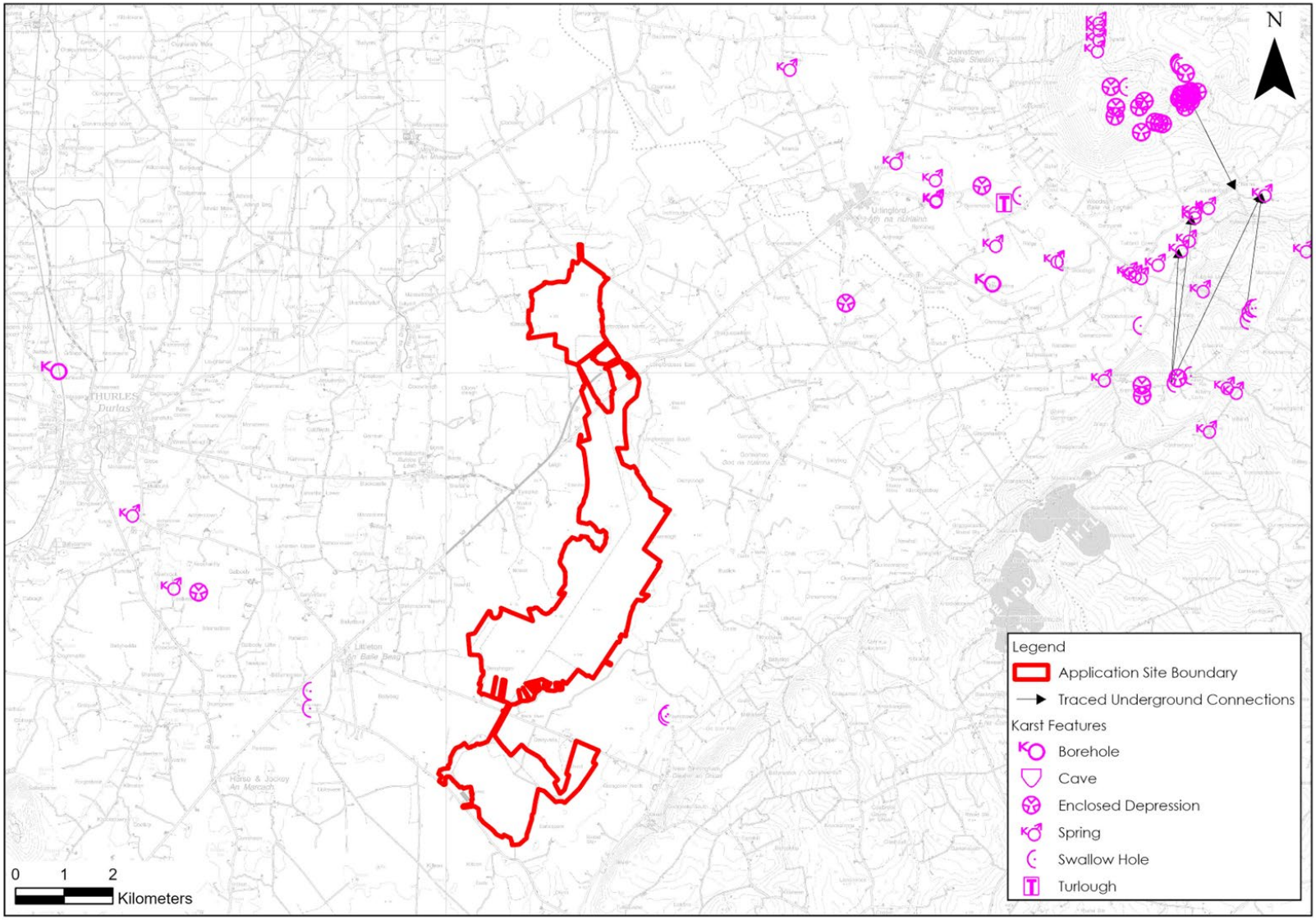

Plate 8-14: Map of Local Karst Features

8.4.9 Groundwater Vulnerability

The GSI describe groundwater vulnerability as a term used to represent the natural ground characteristics that determine the ease with which groundwater may be contaminated by human activities. Groundwater vulnerability embodies the characteristics of the intrinsic geological and hydrogeological features at a site that determine the ease of groundwater contamination. Groundwater vulnerability is related to recharge acceptance, whereby in areas where recharge occurs more readily, a higher quantity of contaminants will have access to groundwater.

The GSI mapped vulnerability rating of the bedrock aquifer underlying Application Site ranges from 'Low' to 'High'. The areas of high vulnerability are mapped at the perimeter of the bog, with the majority of the Application Site mapped as having 'Moderate' vulnerability.

Extensive peat probing and site investigations (trial pits and boreholes) have shown that the bogs comprising the Application Site are overlain by low permeability peat deposits which are in turn typically underlain by low permeability SILTs and CLAYs. The cohesive deposits are in turn underlain by granular deposits comprising of GRAVELs. The peat in some areas towards the centre and south of Littleton Bog is underlain directly by granular deposits (sands). These deposits allow for some infiltration into the underlying bedrock aquifers. The areas of groundwater recharge are likely to be limited in extent and recharge rates will be relatively slow. Furthermore, the presence of large bodies of standing water in the centre of Littleton Bog, which remain in summer and during drier periods, indicate that groundwater recharge rates are very low.

No rock was encountered in any of the trial pits completed within the bog areas which extended to a maximum depth of 4.5mbgl. 3 no. boreholes drilled in the lands to the east of Littleton Bog as part of the site investigations for the Proposed Littleton Wind Farm encountered bedrock at depths of 9.1mbgl and was described as strong to strong bedded dark grey fine to coarse grained argillaceous LIMESTONE.

Table 8-16: Groundwater Vulnerability and Subsoil Permeability and Thickness

Vulnerability Rating	Hydrogeological Conditions				
	Subsoil Permeability (Type) and Thickness			Unsaturated Zone	Karst Features
	High permeability (sand/gravel)	Moderate permeability (e.g. Sandy subsoil)	Low permeability (e.g. Clayey subsoil, clay, peat)	(Sand/gravel aquifers only)	(<30 m radius)
Extreme (E)	0 - 3.0m	0 - 3.0m	0 - 3.0m	0 - 3.0m	-
High (H)	>3.0m	3.0 - 10.0m	3.0 - 5.0m	>3.0m	N/A
Moderate (M)	N/A	>10.0m	5.0 - 10.0m	N/A	N/A
Low (L)	N/A	N/A	>10.0m	N/A	N/A

Notes: (1) N/A = not applicable.
(2) Precise permeability values cannot be given at present.
(3) Release point of contaminants is assumed to be 1-2 m below ground surface.

8.4.10 Groundwater Hydrochemistry

There is no groundwater quality data for the Application Site. Groundwater sampling would generally not be undertaken during the process of peat extraction, as groundwater quality impacts would not be anticipated given the shallow nature of the peat extraction works, the presence of low permeability soils and subsoils which restrict groundwater recharge, and the low potential for groundwater dispersion and movement within the aquifer as outlined in the preceding sections. Consequently, no groundwater sampling was required as part of the IPC licence conditions for the extraction of peat at the Application Site.

The GSI's Templemore GWB Characterisation Report (GSI, 2003) states that groundwaters in this GWB will have a calcium bicarbonate chemical signature. Water sampling by the EPA shows that these waters are very hard with typical values of 400mg/l $CaCO_3$ and have a high electrical conductivity of around 800µS/cm.

The GSI's Thurles GWB Characterisation Report (GSI, 2003) states that the groundwaters in this GWB also have a calcium-bicarbonate signature and that the hardness could be classified as being "excessively hard" (373-453mg/l $CaCO_3$).

8.4.11 Water Framework Directive

The EU Water Framework Directive (2000/60/EC), as amended by Directives 2008/105/EC, 2013/39/EU and 2014/101/EU ("WFD"), was established to ensure the protection of the water environment. The Directive was transposed in Ireland by the European Communities (Water Policy) Regulations 2003 (S.I. No. 722/2003).

The Water Action Plan 2024 was published in September 2023 and is Ireland's 3rd River Basin Management Plan. Its objectives include the following:

- Ensure full compliance with relevant EU legislation;
- Ensure full compliance with relevant EU legislation;
- Build on the achievements of the 2nd Cycle;
- Prevent deterioration and maintain a 'high' status where it already exists;
- Protect, enhance and restore all waters with aim to achieve at least good status by 2027;
- Ensure waters in protected areas meet requirements; and,
- Implement targeted actions and pilot schemes in focused sub-catchments aimed at restoring impacted waters and protecting waters from deterioration.

Our understanding of these objectives is that surface waters, regardless of whether they have 'Poor' or 'High' status, should be treated the same in terms of the level of protection and mitigation measures employed, i.e. there should be no negative change in status at all. Furthermore, any development must not in any way prevent a waterbody from achieving at least good status by 2027.

We note that there is no requirement to assess the peat extraction and ancillary activities at the Application Site which pre-date 2003 and the required transposition of the WFD Directive into Irish Law. The impacts of the activities on the WFD status of downstream and underlying waterbodies are assessed in Appendix 8-2, Volume 3.

8.4.11.1 Surface Waterbody Status

Local Surface water Body (SWB) status information is available from (www.catchments.ie). A summary of the WFD status and risk result for SWBs in the vicinity and downstream of the Application Site are shown in Table 8-17 below.

The Breagagh_010 SWB achieved Poor status in the 3rd (2016-2021) and 4th (2019-2024) WFD cycles. Further downstream the Breagagh_020 SWB achieved Moderate status in the 3rd and 4th WFD cycles. The North Glengoole Stream_010 SWB achieved Poor status in the 3 no. most recent WFD cycles. The Black (Twomileborris)_010 SWB achieved Poor status in the latest WFD cycle (2019-2024) which was a deterioration from the Moderate status it achieved in previous cycles. The status of the Drish River in the vicinity of the Application Site has largely been of Poor status. However, the Drish_040 and Drish_050 SWBs experienced an improvement to Moderate and Good status respectively in the latest WFD cycles (2019-2024). Further downstream the Drish_060 SWB achieved Moderate status in all WFD cycles.

In terms of risk status, most SWBs in the vicinity and downstream of the Application Site have been deemed to be "at risk" of failing to meet their respective WFD objectives. The risk status of the North Glengoole_010 and Breagagh_020 SWBs is currently "under review".

The 3rd Cycle Suir Catchment Report (EPA, 2024) states that excess nutrients remain the most prevalent issue in the River Suir catchment, with agriculture being the significant pressure effecting the greatest number of waterbodies. Downstream of the Application Site agriculture is listed as being a significant pressure on the Drish_020, Drish_050, Clover_020 and Suir_070 SWBs. Agricultural issues in the River Suir catchment relate to phosphorus loss to surface waters from, for example; direct discharges or runoff from yards, roadways or other compacted surfaces, or runoff from poorly draining soils. High nitrate concentrations have been identified in many waterbodies across the catchment and sediment is also a problem from land drainage works, bank erosion from animal access or stream crossings.

Forestry is listed as being a significant pressure on the Drish_020 and Clover_010 SWBs. Forestry activities including clear felling and drainage have resulted in heavy siltation and excess nutrients. Meanwhile, peat is listed as a significant pressure on several waterbodies in the vicinity and downstream of the Application Site. The Catchment Report states that the main issues relating to peat drainage are elevated ammonia concentrations, increased sedimentation and morphological impacts. Meanwhile, Lisheen mine has been identified as a significant pressure on the Drish_040 SWB resulting in elevated ammonia, increased sedimentation and morphological effects. The Suir_070 SWB is listed as being under significant pressure from urban wastewater. This pressure is associated with the Thurles wastewater treatment plant.

Table 8-17: WFD Surface Waterbody Information

SWB	Status (2010-2015)	Status (2013-2018)	Status (2016-2021)	Status (2019-2024)	3rd Cycle Risk Status	WFD Pressures
Drish_010	Poor	Poor	Poor	Poor	At risk	Forestry
Drish_020	Unassigned	Poor	Poor	Poor	At risk	Agriculture, forestry & peat
Drish_030	Poor	Poor	Poor	Poor	At risk	Peat
Drish_040	Poor	Poor	Poor	Moderate	At risk	Peat & mines and quarries
Drish_050	Moderate	Poor	Poor	Good	At risk	Agriculture & peat
Clover_010	Poor	Poor	Poor	Poor	At risk	Forestry & Industry
Clover_020	Good	Moderate	Moderate	Moderate	At risk	Agriculture
North Glengoole_010	Unassigned	Poor	Poor	Poor	Under Review	None
Black (Twomilebor ris)_010	Moderate	Moderate	Moderate	Poor	At risk	Peat
Drish_060	Moderate	Moderate	Moderate	Moderate	At risk	Other
Breagagh_010	Unassigned	Moderate	Poor	Poor	At risk	Peat
Breagagh_020	Unassigned	Good	Moderate	Moderate	Under Review	None
Suir_070	Good	Moderate	Moderate	Moderate	At risk	Agriculture, urban runoff & urban wastewater

8.4.11.2 Groundwater Body Status

Both the Thurles and Templemore GWBs underlying the Application Site achieved "Good" status in all WFD cycles. The Thurles GWB has been deemed to be not at risk whilst the Templemore GWB is at risk of failing to meet its WFD objectives. No significant pressures have been listed on these GWBs. Summary WFD information for the underlying GWBs is provided in Table 8-18.

Table 8-18: WFD Groundwater Body Information

GWB	Status (2010-2015)	Status (2013-2018)	Status (2016-2021)	Status (2019-2024)	3rd Cycle Risk Status	WFD Pressures
Thurles	Good	Good	Good	Good	Not at risk	None
Templemore	Good	Good	Good	Good	At risk	None

8.4.12 Designated Sites and Habitats

Within the Republic of Ireland designated sites include National Heritage Areas (NHAs), Proposed National Heritage Areas (pNHAs), Special Areas of Conservation (SACs), candidate Special Areas of Conservation (cSAC) and Special Protection Areas (SPAs). A designated site map for the area is shown as Plate 8-15.

There are no designated sites located within or in close proximity to the Application Site.

The Lower River Suir SAC (Site Code: 002137) is located ~9.3km west of the Application Site and is hydrologically connected to the Application Site via the Drish River (and its associated tributaries). This SAC consists of the freshwater stretches of the River Suir immediately south of Thurles and the tidal stretches as far as the confluence with the Barrow and Nore near Cheekpoint, Co. Waterford. The length of the shortest hydrological flowpath between the Application Site and the SAC is greater than 17km. With respect to timelines the Lower River Suir SAC was designated under the EU Habitats Directive, being formally designated in Irish law under S.I. 650/2004. However, the site has long been a Natura 2000 site, since 1992. Therefore, importantly, the baseline environment at the time of designation occurred during the Peat Extraction Phase.

The Cabragh Wetlands pNHA (Site Code: 001934) is located ~9.3km west of the Application Site and is hydrologically connected to the Application Site via the Drish River and the River Suir. The length of the hydrological flowpath between the Application Site and the pNHA is greater than 17km.

Other designated sites within 10km of the Application Site include:

- Kilcooly Abbey Lake pNHA (Site Code: 00958) located ~5.0km to the east. This pNHA is located in the River Nore surface water catchment. Therefore, there is no hydrological connection between the Application Site and this pNHA.
- The Loughans SAC and pNHA (Site Code: 00407) is located ~7.8km to the east. This SAC is located River Nore surface water catchment. Therefore, there is no hydrological connection between the Application Site and this SAC.
- Spahill and Clomantagh Hill SAC and pNHA (Site Code: 000849) is located ~9.8km northeast of the Application Site. This designated site is located in the River Nore surface water catchment. Therefore, there is no hydrological connection between the Application Site and this SAC.
- Cabragh Wetlands pNHA (Site Code: 001934) is located ~9.3km west of the Application Site. The Drish River acts as a hydrological barrier between the Application Site and this pNHA.
- Killough Hill pNHA (Site Code: 000959) is located ~8.3km west of the Application Site. The Breagagh and Black Rivers act as hydrological barriers between the Application Site and this designated site.
- Laffansbridge pNHA (Site Code: 000965) is located ~3.5km south of the Application Site. The Breagagh River acts as a hydrological barrier between the Application Site and this pNHA.

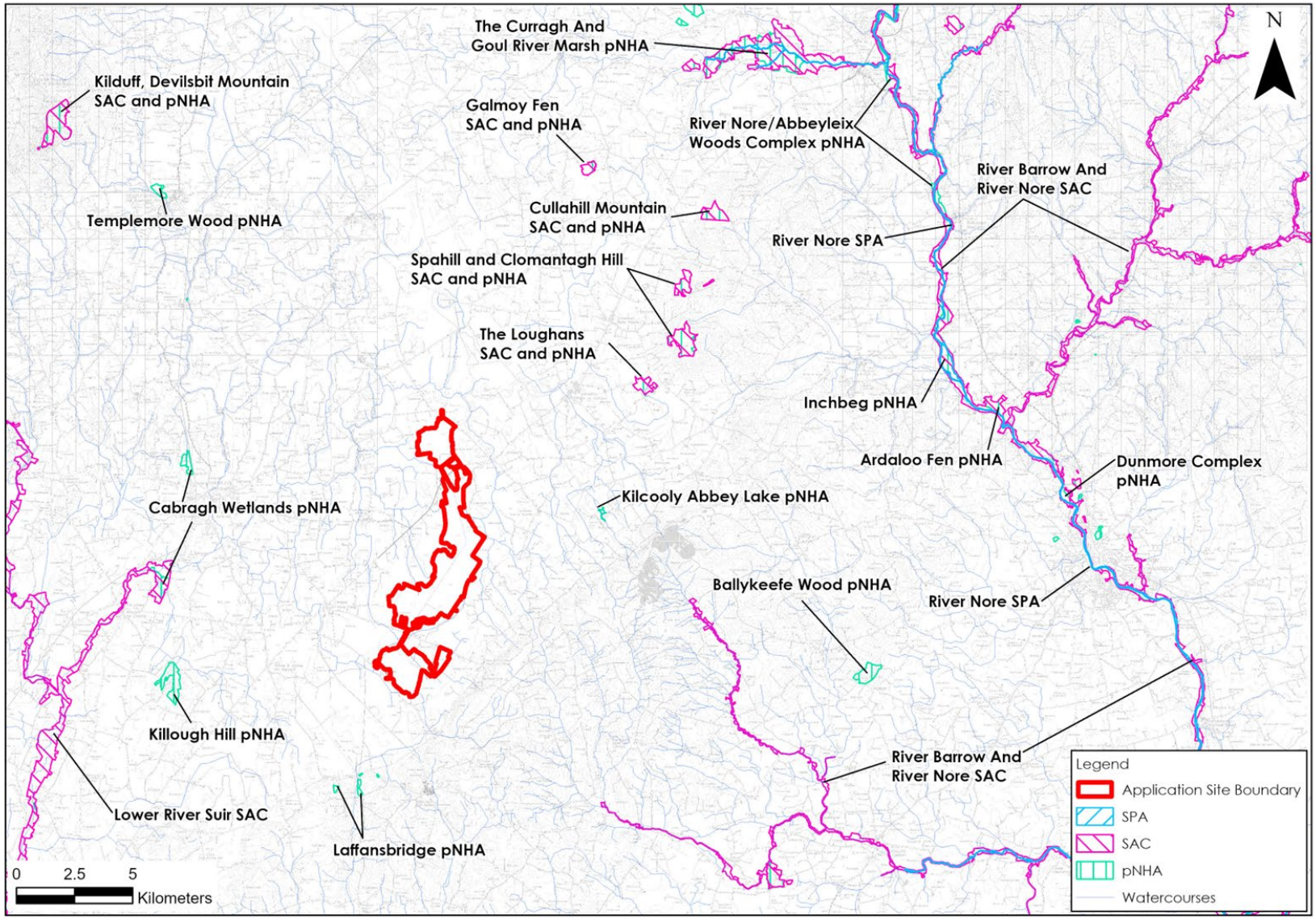

Plate 8-15: Local Designated Sites

8.4.13 Water Resources

8.4.13.1 Surface Water Resources

There are no SWB DWPAs (Drinking Water Protected Areas) located in the area or immediately downstream of the Application Site. The closest DWPA is the Suir_140 SWB located near Cahir. The length of the hydrological flowpath between the Application Site and this DWPA is in excess of 50km.

8.4.13.2 Groundwater Resources

No source protection areas associated with any Public Water Supplies (PWS) or Group Water Schemes (GWS) are mapped within the Application Site. Local groundwater resources are shown on Plate 8-16.

However, there are several public and group supplies in the surrounding lands:

- The closest mapped source protection area to the Application Site is associated with Leigh GWS. This source protection area is mapped immediately to the west of the Application Site in the townland of Leigh.
- The delineated source protection area associated with the Newhill GWS is located ~850m to the northwest of the Application Site.
- The delineated outer source protection area associated with the Two-Mile-Borris PWS is located ~2.7km to the west of Littleton Bog. According to the GSI's Groundwater Source Protection Zone Report (GSI, 2002) The water source is a borehole in the townland of Borris, at a T-junction in the middle of Twomileborris village, some 7 km east of Thurles. The daily abstraction rate is listed as 120m^3/day. The report notes that the water table in the area is assumed to broadly reflect topography, with groundwater flowing in a wet-northwest direction, with this source drawing water from the Aghmacart Formation. The outer source protection zone delineates the complete catchment to the source i.e. the area required to support an abstraction from long-term recharge. The Application Site does not encroach upon this catchment.
- The outer source protection area associated with the Moyne GWS is located ~280m to the north of Longfordpass Bog. According to the EPA's Establishment of Groundwater Source Protection Zone Report for the Moyne Group Water Supply Scheme (EPA, 2010) this GWS is supplied by 2 no. wells in the townland of Kilmakill. Water is pumped in each borehole in alternative months, with the maximum abstraction rate from each well is 816m^3/day. The Report states that groundwater flows in a south-westerly direction towards the source and that the primary aquifer is the Aghmacart Formation. No area of the Application Site overlaps with the delineated source protection areas.
- The source protection area associated with the Fethard Coalbrook PWS is located ~3.1km to the east of the Application Site. This PWS is located in the River Nore surface water catchment and in the Slieveardagh Hills GWB, and there is no potential surface or groundwater connectivity with the Application Site.
- The Fenor Inch GWS is located ~2.2km to the northeast of the Application Site. The Drish River acts as a hydraulic boundary between GWS and the Application Site.
- The Longford Pass GWS is located ~720m to the northeast of the Application Site.

A search of private well locations (accuracy of 1 – 50m only) was undertaken using the GSI well database (www.gsi.ie). The GSI do not record any wells within the Application Site. Several wells with a locational accuracy ≥1km are mapped by the GSI in the surrounding lands. These wells are generally listed as having agricultural and domestic uses.

We accept that the GSI database does not include all potential water wells. As such, and in order to be conservative, for the purposes of assessment as completed in Section 8.6.1.6, we assume that there is a groundwater well source at each local house location as identified in Chapter 5 - Population and Human Health, Volume 2, of this rEIAR.

An information request was submitted to Uisce Éireann for the location of all Uisce Éireann groundwater abstraction locations within 5km of the Application Site. No groundwater abstractions other than those listed above were identified.

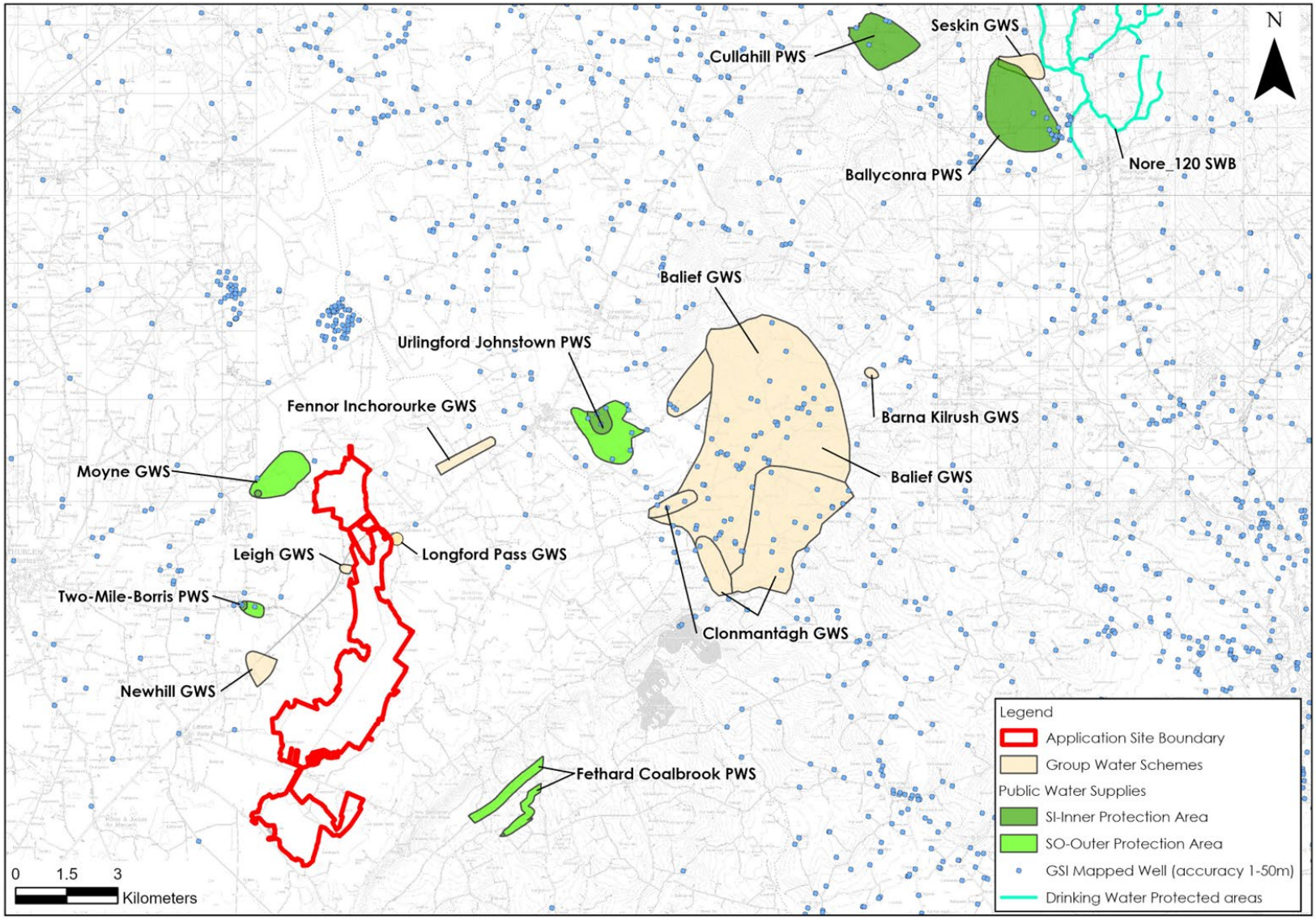

Plate 8-16: Local Groundwater Resources

8.4.14 Receptor Sensitivity and Importance

Due to the nature of peat extraction and ancillary activities, being near-surface activities, impacts on groundwater quality and quantity are generally negligible as there is still considerable depths of peat remaining at the Application Site, although deep perimeter drains may have local drainage impacts on surrounding land. It is also noted that there may be some very minor recharge to ground in Littleton Bog - considered to be very limited as the large areas of standing water remain during dry periods indicating that they are underlain by low permeability subsoils. Surface waters are considered to be the main sensitive receptor, as drainage of the Application Site will potentially have altered the local natural hydrological regime.

Based on the criteria set out in Table 8-4 above, the Regionally Important Karst Aquifer underlying the Application Site can be considered to be of Very High Importance, whilst the Locally Important Aquifers can be considered to be Medium Importance. The primary risks to groundwater during peat extraction and ancillary activities, would have been from hydrocarbon spillage and leakages from plant serving and facilitating the peat extraction and ancillary activities. The Application Site is covered in cutover peat which in turn is underlain by lacustrine clay and/or silt dominated glacial deposits and these layers act as a protective cover to the underlying bedrock aquifers. The glacial deposits are not mapped as an aquifer in this area, but they are likely to be used locally as a water supply and therefore they can also be classed as sensitive to groundwater pollution. However, due to the presence of the peat and silt/clay layers (which have low permeability and act as a barrier to infiltration), any contaminants which may be accidentally released on-site are more likely to travel to nearby streams within surface runoff than to recharge to ground.

For the purposes of a conservative assessment, the following groundwater receptors are included in the remedial impact assessment:

- The Locally Important and Regionally Important Aquifers which underlie the Application Site.
- The WFD status of the Thurles and Templemore GWBs underlying the Application Site.
- The Longfordpass GWS, Leigh GWS, Newhill GWS, Two-Mile-Borris PWS and Moyne GWS in the vicinity of the Application Site (Note that all other PWS/GWS have been screened out of the assessment due to the lack of hydrogeological connectivity and the separation distances).
- Local private groundwater abstractions in the lands surrounding the Application Site.

Surface waters are the main sensitive receptors associated with the Project given that the Application Site discharges via surface water outfalls to tributaries of the Drish River. At the beginning of the assessment period i.e., the July 1988 baseline, the Breagagh and Drish rivers were of High to Very High Importance based on their biological Q-ratings. The Black (Two Mile Borris) River was of High Importance whilst the Clover River was of Low to Medium Importance. During peat extraction and ancillary activities, the main risks to local surface water quality would have been increased concentration of suspended solids and increased flow volumes downstream. In addition, hydrocarbon spillage and leakages would have been a constant potential threat to water quality during peat extraction and ancillary activities.

The following surface water receptors are identified for the remedial impact assessment:

- The Drish River and its associated tributaries, including the Black (Two Mile Borris), Clover and Breagagh rivers.
- The WFD status of all SWBs downstream of the Application Site.

In terms of designated sites, only those designated sites which are hydrologically/hydrogeologically linked with the Application Site will be included in the impact assessment. These include:

- The Lower River Suir SAC downstream of the Application Site.
- The Cabragh Wetlands pNHA.

8.5 Characteristics of the Project

8.5.1 Peat Extraction Phase (July 1988 - 2017)

A full description of the peat extraction and ancillary activities completed at the Application Site from July 1988 to 2017 are described in detail in Chapter 4 - Description of the Development, Volume 2.

By 1988 peat extraction and ancillary activities were well established at the Application Site. Sod peat extraction had ceased and milled peat extraction was well underway. By this time drainage had been inserted and railway infrastructure was in place. In 1988, the Application Site included 8 no. silt ponds (3 no. at Longfordpass Bog, 4 no. at Lanespark Bog and 1 no. at Derryvella Bog) at the Application Site and 13 no. pumping stations installed; 12no. Littleton Bog and 1 no. at Longfordpass Bog.

During this time period milled peat extraction occurred at the Application Site. Milled peat extraction requires good solar drying condition and can occur anytime from April onwards once suitable drying conditions are present. There are 4 no. stages involved in the process of milled peat extraction outlined below:

- Milling – Involves breaking the top 10-15mm of the peat surface into peat crumbs by powered milling drums which are towed behind tractors. This layer if milled peat has a moisture content of approximately 80%.
- Harrowing – The peat crumbs are left to dry after milling. To assist the drying process, the loose peat is harrowed and turned over. The harrow consists of a series of spoons which are towed behind a tractor.
- Ridging – Once the peat has dried to 45-55% moisture content it is gathered into ridges in the centre of each production field. The ridger consists of a pair of blades towed in an open V behind a tractor, which channels the loose crop into a ridge.
- Harvesting – This is the final stage in the milling process. Each ridge is lifted by a harvester and transferred and dropped on top of the adjoining fields ridge, until 5 ridges have been accumulated together forming a peat storage stockpile. These stockpiles are covered until ready for use. There are approximately 12 harvests a year, depending on weather conditions.

As part of the development of the Application Site for milled peat extraction, parallel surface water drains were created at intervals of 15m, with the section of bog between the drains referred to as production fields. The fields are slightly convex to facilitate runoff and to prevent surface water ponding. The drains fall towards the headland, located at the ends of the production fields. The drains are piped across the headland, allowing machinery to pass from one field to the next. The drainage network then continues to a series of silt ponds prior to discharging to a local watercourse. By 1988, milled drainage had already been implemented across the Application Site. Only very small areas around the perimeter of the Application Site had not been drained at this time.

The peat extraction areas were served by a railway line which was moved around the Application Site as different areas came in and out of production. Much of the railway infrastructure was already in place by 1988. Littleton Works is located along the southern boundary of the Application Site on the L2111 and provided a central location for support and services during the Peat Extraction Phase and included workshops, offices and welfare facilities. The Works were constructed prior to 1988.

In terms of environmental monitoring, control and monitoring measures have been implemented at the Application Site since 2001 in accordance with IPC licence conditions (Refer to Section 4.7). Prior to 2001, control measures were also implemented with respect to silt control, storage and maintenance of machinery, refuelling and waste management (refer to Section 4.3.5).

8.5.2 Current Phase (2017 - Present Day)

The Current Phase of the Project includes all activities carried out at the Application Site from the cessation of peat extraction in 2017 to the present day.

During this period activities at the Application Site have been limited to the undertaking of decommissioning activities as outlined in Section 4.8. of Chapter 4 - Description of the Development, Volume 2, with no industrial peat extraction occurring. To date the decommissioning activities completed at the Application Site include the removal of remaining peat stockpiles from the bogs, which was completed by mid-2019, and the removal of railway infrastructure from Lanespark and Derryvella bogs in 2024.

The drainage infrastructure, silt ponds and surface water discharge locations continue to be in operation and to be maintained as per the IPC Licence requirements. The silt ponds are maintained in accordance with Condition 6 of the IPC Licence, which states that all drainage from boglands is discharged via appropriately designed silt ponds which are desilted twice a year. The silt arising from these operations is either stockpiled a safe distance from drainage features or spread onto peat extraction fields. Environmental monitoring continued during the Current Phase of the Project in accordance with IPC licence conditions.

In addition to the Decommissioning activities, Rehabilitation Phase 1 works have been completed during the Current Phase in accordance with the Cutaway Bog Decommissioning and Rehabilitation Plans (Appendix 4-2, Volume 3). The Rehabilitation Phase 1 works commenced at the Application Site between 2018 and 2021 and comprised of extensive drain-blocking, hydrological management and some fertiliser application to encourage revegetation of the bare peat fields.

8.5.3 Remedial Phase

The Remedial Phase includes the Phase 2 Rehabilitation works which are proposed to be completed in Derryvella Bog. No additional rehabilitation works are proposed in Littleton, Lanespark or Longfordpass bogs, however some measures are ongoing at these bogs under Rehabilitation Phase 1, including ongoing monitoring measures which are detailed in Table 4-8 of Chapter 4 - Description of the Development, Volume 2. As part of the ongoing Rehabilitation Phase 1, targeted active management, including the use of fertiliser to help promote re-colonisation will be completed, if natural re-colonisation has not progressed satisfactorily.

The Rehabilitation Phase 2 works proposed in Derryvella include a series of short-term practical actions (0-2 years) and long-term actions (>3 years) and are detailed in Table 4-9 of Chapter 4 - Description of the Development, Volume 2. The measures include targeted drain blocking, along with fertiliser application targeting bare peat areas of headlands, high fields and other areas (where required) and hydrological management. A long-term goal also includes the decommissioning of silt ponds.

8.6 Assessment of Significant Hydrological and Hydrogeological Effects

8.6.1 Peat Extraction Phase (July 1988 – 2017)

The Peat Extraction Phase of the Project includes all peat extraction and ancillary activities undertaken from July 1988 to the cessation of peat extraction in 2017.

8.6.1.1 Effects of Bog Drainage on Bog Hydrogeology

Impacts on bog hydrogeology can occur through drainage, both by surface water drainage and by groundwater drainage. Surface water drainage (increased frequency of drains and deeper perimeter drains) can impact peat water levels and have an indirect impact on surface vegetation. Increased drainage can also lead to increased runoff volumes from bog units, and this can alter the hydrology (by increased flow volumes, and increased magnitude of downstream flooding events) of the downstream receiving waters. Deep perimeter (bog perimeter) drains can alter the local underlying groundwater hydrogeology as they often intersect the mineral soil layers below the bog.

To determine likely Zones of Influence (ZoI) of bog drainage infrastructures HES has previously completed a Peatland Hydrology Study as defined in Appendix 8-3, Volume 3. From that study, the following conservative ZoIs are defined for the Applicants bog units:

- Field drains can have a ZoI on peat water levels at a distance of up to 30m;
- Deep perimeter bog drains can have a ZoI on peat water levels at a distance of <100m;
- The ZoI of facebank drains depends on the height of the facebank. But a conservative ZoI for a 1.5m high facebank drain is 60m; and,
- The ZoI of Bord na Móna's pumping stations (which are generally <5m deep) on local groundwater levels is likely to be <300m (Please note that 12 no. pumping stations were located at the Application Site in 1988).

These ZoIs are used in the assessment below, and also in the assessment of impacts on designated sites and groundwater supplies.

As stated in Section 8.3.3 in 1998 peat extraction was at its peak in Longfordpass, Lanespark and Derryvella bogs, whilst peat was also being extracted across much of Littleton Bog. At this time the vast majority of the Application Site had been drained whilst only small areas around the perimeter of the bogs remained undrained at this time.

Following the initial drainage, which preceded July 1988 and occurred from the 1940s, there would have only been minor annual changes in local bog hydrology and hydrogeology associated with the annual removal of peat and the deepening of drains if required. According to Plates supplied by the Applicant, the total volume of peat removed from the Application Site from July 1988 to 2017 is estimated to be 5,117,798 tonnes (with an average of 170,593 tonnes of peat extracted per year). The depths of peat removed from each area of the Application Site would vary as each area has experienced its own unique history of peat extraction. As peat can act as a hydraulic sponge providing storage of water, the removal of peat potentially acts to reduce the [water] storage capacity of the Application Site. However, when peat water levels within the Application Site were reduced historically through initial bog drainage, the [water] storage capacity of the top ~0.5 – 1m of peat (dependent on the depth of drains) was essentially removed.

As such, the primary and significant hydrological and hydrogeological changes commenced when the initial drainage occurred and the development of ancillary activities was installed (e.g. railway lines, welfare facilities). These works pre-date July 1988.

Pathways: Groundwater volume and water level drawdown.

Receptors: Peat Bog Hydrogeology.

Assessment of effects in the absence of control measures: As the vast majority of the Application Site was already drained by July 1988, the effect of continuing peat extraction and ancillary activities until 2017 would not have resulted in any major alteration of the local hydrogeological regime. The peat water table and underlying groundwater table at the bog had already been locally lowered during their initial draining which pre-dated July 1988. Only minor annual changes would have occurred during this phase of the Project. The effects on bog hydrogeology in the absence of control measures would have been similar to the residual effect described in Section 8.8.1.1 i.e. permanent, moderate, negative, direct, long-term likely effect on the bog hydrogeology.

8.6.1.2 Effects of Bog Drainage on Downstream Surface Water Hydrology/Quality

Hydrological changes at the Application Site commenced when the initial drainage occurred (pre-July 1988). The initial implementation of the bog drainage was at that time a significant change to the local hydrology. Peat can act as a hydraulic sponge providing storage of water. However, with the implementation of bog drainage, the water levels in the peat bog are lowered and the capacity of the bog to store water is reduced. The available water storage within the bog would have provided a small buffer for downstream flooding.

In terms of surface water quality, the primary potential negative impact on surface water quality would be the increase in suspended solids entrainment in surface waterbodies. The greatest risk of suspended sediment entrainment occurs during times of major earthworks, such as during the removal of vegetation and the construction of the bog drainage network. This potential pathway would pose a significant risk to local surface water quality downstream of the Application Site.

By 1988 the vast majority of the Application Site was already artificially drained. Consequently, the continued drainage of the bog during the Peat Extraction Phase of the Project would have been limited in its potential to alter the hydrological regime in downstream watercourses. However, during the Peat Extraction Phase, there was an ongoing risk of elevated concentrations of suspended solids making their way into downstream surface watercourses from the erosion of peat sediment via the bog drainage network. This potential pathway would pose a significant risk to local surface water quality, particularly as the Breagagh, Black (Two Mile Borris), Clover and Drish rivers and their associated tributaries. These watercourses were of Low to Very High Importance in 1988. Other water quality parameters of concern are ammonia and Chemical Oxygen Demand (COD).

The main potential for effects would have been on the smaller streams and watercourses which received discharge from the drainage system at the Application Site. The potential for effects would have progressively reduced further downstream in the Drish River due to the increased flow volumes (refer to Section 8.4.3).

Pathway: Drainage and surface water discharge routes.

Receptor: Surface water quality and quantity in the receiving streams (Breagagh River, North Glengoole Stream, Clover River, Black (Two Mile Borris) River, Drish River and all associated tributaries and water-dependent ecosystems.

Assessment of effects in the absence of control measures: In the absence of the control measures relating to surface water management, the effect could potentially have been significantly greater than the residual effect described in Section 8.8.1.2. The effect would have been a significant, long-term, negative, indirect likely effect on downstream surface water quality and a significant, long-term, negative and indirect effect on downstream surface water quantity (i.e. river flows). The greatest effects would have occurred in the receiving streams closest to the Application Site, with the significance of effects decreasing progressively downstream along each waterbody.

8.6.1.3 Contamination of Groundwater by Leakages and Spills

Accidental spillage during refuelling of machinery and plant (static and mobile) with petroleum hydrocarbons is a pollution risk. The accumulation of small spills of fuels and lubricants during routine plant use can also be a significant pollution risk over time. Hydrocarbons have a high toxicity to humans, and all flora and fauna, including fish, and is persistent in the environment. Large spills or leaks have the potential to result in significant effects (i.e., contamination of peat, subsoils and pollution of the underlying aquifer) on the geological and water environment.

Discharges from wastewater systems (septic tanks) at office buildings, and at welfare facilities and workshops could potentially have caused groundwater contamination. Activities and features associated with peat extraction include railway lines and, welfare facilities. These potential impacts existed across the Application Site, but we understand from a review of available AERs (Annual Environmental Reports submitted to the EPA under the IPC licences) reports that no significant pollution events/spills to groundwater have occurred since 2001. It is noted that where spills are recorded in the AERs, that these are described as minor spills and the remediation measures were implemented, and preventative measures taken to ensure that similar spills did not recur at the Application Site.

Pathway: Infiltration through pore space in peat, subsoil and bedrock.

Receptor: Local Groundwater Quality.

Assessment of effects in the absence of control measures: In the absence of the control measures the effect could have been a potentially greater effect than the residual effect described in Section 8.8.1.3. However, there is no knowledge of significant groundwater contamination across the Application Site and given the nature of the local hydrogeological regime with limited and slow groundwater recharge rates no significant effects would have occurred. The effect in the absence of control measures would have been a slight, long-term, negative, indirect and unlikely effect on groundwater quality.

8.6.1.4 Contamination of Surface Water by Leakages and Spills

Accidental spillage of petroleum hydrocarbons during refuelling of machinery and plant (static and mobile) construction plant with petroleum hydrocarbons is a significant pollution risk to surface waters and associated ecosystems and to terrestrial ecology. The accumulation of small spills of fuels and lubricants during routine plant use can also be a pollution risk. Hydrocarbon has a high toxicity to humans, and all flora and fauna, including fish, and is persistent in the environment. It is also a nutrient supply for adapted micro-organisms, which can rapidly deplete dissolved oxygen in waters, resulting in the death of aquatic organisms.

Discharges from wastewater systems (septic tanks) at office buildings, and at welfare facilities and workshops could potentially have caused surface water contamination. Activities and features associated with peat extraction include railway lines and welfare facilities. These potential impacts existed across the Application Site, but we understand from a review of available AER (Annual Environmental Reports submitted to the EPA under the IPC licence) reports that no significant pollution events/spills to groundwater have occurred since 2001. It is noted that where spills are recorded in the AERs, that these are described as minor spills and the remediation measures were implemented, and preventative measures taken to ensure that similar spills did not recur at the Application Site.

The main receptors would have been the streams located downstream of the Application Site drainage outfall locations.

Pathway: Overland flow and site drainage network.

Receptor: Surface water quality in the receiving streams (Breagagh River, North Glengoole Stream, Clover River, Black (Two Mile Borris) River, Drish River and all associated tributaries and water-dependent ecosystems.

Assessment of effects in the absence of control measures: In the absence of the IPC licence control measures the effect could potentially have been greater than the residual effect described in Section 8.8.1.4, but to the best of our knowledge there was no evidence of significant contamination at the Application Site, and if there was a spill it would have been localised and would likely have been absorbed by the environment at a local scale. The effect could potentially have been a significant, long-term, negative, indirect and unlikely effect on surface water quality. The greatest effects would have occurred on the receiving streams with the significance of effects decreasing progressively downstream.

8.6.1.5 Effects Associated with Supporting Infrastructure

A number of ancillary structures and infrastructure were associated with the peat extraction and ancillary activities at the Application Site. These included the Littleton Works, offices, local holding areas and railway infrastructure. Since the cessation of peat extraction much of the ancillary infrastructure has been decommissioned, with substitute consent not being sought in respect of certain elements owing to their respective planning statuses (refer to Chapter 4 - Description of the Development, Volume 2). During the Peat Extraction Phase temporary rail lines were moved around the Application Site as required depending on the location of the active peat fields.

The greatest potential for effects would have been associated with refuelling and the storage of hydrocarbons at the Works. Any accidental spillages or leaks would have the potential to affect the local water environment. Furthermore, welfare facilities were provided at the Works and the effects associated with the wastewater treatments systems and water supplies would have had the potential to affect the water environment.

Pathway: Infiltration through pore space in peat, subsoil and bedrock, and site drainage network.

Receptor: Local groundwater quality, and surface water quality in the receiving streams (Breagagh River, North Glengoole Stream, Clover River, Black (Two Mile Borris) River, Drish River and all associated tributaries and water-dependent ecosystems.

Assessment of effects in the absence of control measures: In the absence of the IPC licence control measures the effect could potentially have been greater than the residual effect described in Section 8.8.1.5, but to the best of our knowledge there was no evidence of significant contamination at the Application Site. The effect could potentially have been a significant, long-term, negative, indirect and unlikely effect on surface water quality and a slight, long-term, negative, indirect and unlikely effect on groundwater quality.

8.6.1.6 Effects on Groundwater Abstractions

Historic impacts on the nearby Longfordpass GWS, Leigh GWS, Newhill GWS, Two-Mile-Borris PWS and Moyne GWS, and local private groundwater wells can be assessed on the basis of impacts relating to groundwater quality and water quantity (the volume of water available).

Groundwater flowpaths from the Application Site are likely to be short and will discharge into the local surface water features. Furthermore, given the low permeability of the peat, soils and subsoils at the Application Site, groundwater recharge will be significantly restricted. In addition, the Application Site is not mapped with the source protection area associated with any PWS or GWS.

The Longford Pass GWS is located ~160m east of the Application Site. No rivers or streams are mapped in the lands between the Application Site and this GWS. No source protection area has been delineated for this GWS. However, it is noted from the 4 no. boreholes which were drilled in the local area as part of the site investigations for the proposed Littleton Wind Farm, that the rock in this area was described as medium strong, massive, medium to coarse grained dolomitic LIMESTONE and strong fossiliferous argillaceous LIMESTONE. No groundwater strikes are recorded on the drilling logs. Furthermore, the area of the Application Site located closest to this GWS, discharges to local surface waters and there is no local discharge to ground. Therefore, there was very limited potential for effects on the Longford Pass GWS.

The Leigh GWS is located immediately to the northwest of the Application Site. No rivers or streams are mapped in the lands between the Application Site and the delineated source protection area. However, this area of the Application Site is underlain by Locally Important Aquifers, groundwater flowpaths will be short and will discharge into the local surface water features, including the large boundary drains which exist along the perimeter of Littleton Bog. Furthermore, given the low permeability of the peat, soils and subsoils, groundwater recharge will be significantly restricted and the water in the peat bog is hydraulically isolated from groundwater in the surrounding lands.

The Newhill GWS is located ~850m to the west of the Application Site. The Clover and Black (Two Mile Borris) rivers which act as hydraulic barriers between the Application Site and this GWS.

The Two-Mile-Borris PWS is located ~2.7km to the west of Littleton Bog. The Clover River acts as a hydraulic barrier between the Application Site and this PWS.

The Moyne GWS is located ~1.6km west of the Application Site. An unnamed tributary of the Drish River acts as a hydraulic barrier between the Application Site and this GWS.

Any private groundwater well that may also exist at local dwellings in the lands surrounding the Application Site are reliant on groundwater flows in the deeper bedrock aquifer underlying the glacial deposits. Deep groundwater recharge from the Application Site to the underlying bedrock aquifers or glacial deposits will have been minimal. The restriction of recharge relates to the generally impermeable layers which underlie much of Irelands' bogs leading to a 4% recharge coefficient for the bogs. Therefore, the majority of the groundwater drainage and seepage in the bog would have a lateral flow direction, discharging into the perimeter drains and entering the surface water drainage network in the lands surrounding the Application Site.

Pathway: Groundwater recharge and groundwater flow paths and site drainage network.

Receptor: Local groundwater quality and groundwater quantity, the Leigh GWS, Newhill GWS, Two-Mile Borris GWS, Moyne GWS, Longford Pass GWS and private groundwater well supplies.

Assessment of effects in the absence of control measures: Even in the absence of control measures there would not have been a significant effect on local groundwater supplies due to the hydrogeological regime of the Application Site which is characterised by high rates of surface water runoff with very limited groundwater recharge. The effect in the absence of control measures would have been similar to the residual effect described in Section 8.8.1.6 i.e. a negative, imperceptible, indirect, long-term, unlikely effect on groundwater quality and groundwater quantity.

8.6.1.7 Effect on Designated Sites

As previously identified, there is a conceptual link between groundwater and surface water across the Application Site, whereby groundwater (entering shallow perimeter drains) and surface water within the bog primarily drains to surface water bodies situated around the Application Site. Pathways (flow routes) with nearby and regionally located (downstream) SAC/SPAs (Natura 2000 sites) were identified by digital tracing/tracking hydrological flow paths between the Application Site and their downstream discharge points on a local and a regional scale.

The Lower River Suir SAC and the Cabragh Wetlands pNHA are located downstream of the Application Site via the Drish River and its tributaries. The shortest hydrological flowpaths between the Application Site and the SAC and pNHA are in excess of 17km.

Alteration of the hydrological regime at the Application Site may have altered flows from the bog which ultimately discharge to the Drish River and its tributaries. Note that even at the time when the bog was drained (pre-July 1988) the potential for effects on the River Suir would have been limited given the length of the hydrological flowpaths and the large volumes of water within the River Suir.

The vast majority of the Application Site was drained prior to July 1988 and well before the SAC designation. The local baseline environment for the SAC in its year of designation, therefore, included the Application Site in its drained state.

Pathway: Surface water drainage network. Drainage from the Application Site discharges to outfall points and streams, which discharge to the Drish River and its tributaries which connect downstream to the River Suir and the Lower River Suir SAC and the Cabragh Wetlands pNHA.

Receptors: Lower River Suir SAC and the Cabragh Wetlands pNHA.

Assessment of effects in the absence of control measures: Even in the absence of control measures there would not have been a significant effect on downstream designated sites due to their distant location from the Application Site and the large volumes of water within the River Suir. The effect in the absence of control measures would have been similar to the residual effect described in Section 8.8.1.7 i.e. an imperceptible, long-term, negative, indirect likely effect on the hydrology (flows and water quality) of the Lower River Suir SAC and the Cabragh Wetlands pNHA.

8.6.1.8 Effect on the WFD Status of Surface and Groundwater Bodies

The Application Site has been subject to drainage and peat extraction and ancillary activities since 1941, i.e. more than 60 years before the WFD existed.

As described above, the primary hydrological and hydrogeological changes associated with the peat extraction and ancillary activities occurred during the initial drainage of the bog in advance of peat extraction. Constructed drainage ditches drain the upper surface of the bog by lowering the local peat water table. At this time, ancillary features were also constructed including railway lines, and welfare facilities. After the Application Site was drained, vegetation was removed from the bog surface, leaving only bare peat fields between the drains. During the Peat Extraction Phase, only minimal landuse change occurs which predominantly relate to minor annual topographic changes (i.e., lower ground levels) caused by ongoing peat extraction. The vast majority of the Application Site has been drained before 1988.

However, in terms of WFD Compliance Assessment, there is no requirement to assess the peat extraction activities at the Application Site which pre-date 2003 and the required transposition of the WFD Directive into Irish Law.

As the 1st WFD cycle was completed in 2010-2015, no WFD status existed for the early part of the Peat Extraction Phase. However, EPA Q-rating values are available from 2002 to 2023 for watercourses downstream of the Application Site.

The Q-data shows a relatively stable trend in Q-values during this period with the majority of watercourses fluctuating between Q3 ("Poor" Q-status) and Q4 ("Good" Q-status), ranging from moderately polluted to unpolluted. No watercourses in the vicinity of the Application Site achieved a High Q-rating since 2002. Any changes in terms of water quality during this period cannot be attributed solely to peat extraction activities which were being scaled back at this time, with changes also likely reflecting other issues in the wider catchments such as agricultural or forestry practices.

It is considered that with the implementation of the control measures in accordance with IPC Licence Requirements the status of the SWBs throughout the early Peat Extraction Phase (2003-2010) of the Project were comparable to those recorded in the 1st WFD cycle (2010-2015) or the 2nd Cycle (2013-2018) where SWBs have not been assigned a status in the 1st cycle.

Pathway: Groundwater recharge and surface water runoff.

Receptor: Downstream surface waterbodies and the underlying Thurles and Templemore GWBs.

Assessment of effects in the absence of control measures: In the absence of the control measures the effect on SWBs would have been greater than the residual effect described in Section 8.8.1.8. The effect would have been a significant, short-term, negative and indirect effect on downstream surface waterbody status. However, given the hydrogeological setting of the Application Site there would have been no effect on the WFD status of the underlying GWBs.

8.6.2 Current Phase (2017 – Present Day)

The Current Phase of the Project encompasses the period of time between the cessation of peat extraction at the Application Site in 2017 to the present day.

8.6.2.1 Effects of Bog Drainage on Bog Hydrogeology

No significant negative effects on bog hydrogeology have occurred since the cessation of peat extraction in 2017. By 2017, all drainage infrastructure (field drains, main drains, silt ponds etc.) would have been in place across the Application Site for between 49 and 76 years. The hydrogeological regime would have been well established with field drains lowering the perched groundwater table in the adjacent former peat production fields.

During the Current Phase, Rehabilitation Phase 1 works were completed across the Application Site as part of the Decommissioning and Rehabilitation Plans. The overall aim of the rehabilitation plan is to put the Application Site on a trajectory towards becoming a naturally functioning peatland. The drainage system for peat extraction was designed to lower the local water table in the bog. This lowered peat water table does not support typical bog communities. Therefore, in order to achieve the aims of the rehabilitation plan, it was necessary to alter the drainage regime at the Application Site through extensive drain blocking and hydrological management. These works were completed between 2018 and 2021 and will encourage natural re-vegetation of the cutaway areas with typical bog communities in the future. The drain blocking has established a more suitable hydrological/hydrogeological regime where the peat water table is much closer to the surface than it was during the Peat Extraction Phase. It is noted that post-rehabilitation monitoring in other sites has shown that groundwater levels in rewetted bogs can recover relatively quickly i.e. within 2-5 years.

The magnitude of this positive effect varies across the Application Site, dependent on the local intensity of the drain blocking programme where different areas of the site may have been deemed more suitable for rewetting than others.

Pathways: Water volume and peat water level rise.

Receptors: Local peat bog hydrology/hydrogeology.

Assessment of effects in the absence of control measures: The pre-mitigation potential effect of the Current Phae, including the Rehabilitation Phase 1 works, is considered to be a positive, direct, moderate, permanent likely effect on the bog hydrogeological regime.

8.6.2.2 Effects of Bog Drainage on Downstream Surface Water Hydrology

With the cessation of peat extraction, there was less potential for disturbance of peat and elevated concentrations of suspended sediments entering surface watercourses. Similarly, the activity of machinery and plant has been reduced, therefore lowering the potential occurrence of accidental spillages of hydrocarbons.

During this period the site drainage still operated under the same drainage systems as during the Peat Extraction Phase i.e. field drains, main drains, silt ponds and discharge outlets etc. Therefore, discharge volumes from the Application Site to nearby surface watercourses will be comparable to surface water discharges during the operational phase.

Whereas draining the Application Site to facilitate peat extraction had an adverse impact on downstream surface watercourses, the Rehabilitation Phase 1 works completed as part of the Current Phase (including extensive drain blocking) will have resulted in improvements in flow and water quality can be achieved through bog rehabilitation and rewetting.

One of the successful criteria for rehabilitation, is revegetation of the Application Site. Sections of the bogs have already re-vegetated, with pioneer vegetation maturing and now developing into a mosaic of typical cutaway peatland habitat, with bare peat areas being limited and natural colonisation being effective proving effective to date in many areas. This vegetation has helped to stabilise substrates in the previously bare peat fields, thereby reducing the potential for elevated concentrations of suspended solids in site runoff. Additionally, the vegetation has stabilised material in blocked drains, further reducing the potential for the entrainment of suspended solids. Whereas the previously bare peat fields acted as a source of sediment and required silt control measures, the rehabilitated (revegetating) bogs increase the sites solids retention time. Silt ponds continued to operate during the Current Phase and will only be decommissioned when the Application Site is deemed to be on a trajectory of environmental stability and/or rehabilitation has been completed.

The water quality improvements associated with rehabilitated peatlands are not limited to reduced suspended solid concentrations. International studies have shown a long-term reduction in pollutant concentrations, including nitrate and ammonia, following rewetting in comparison to drained peatlands (Pschenyckyj. C. et al. 2021). While several studies have shown that the magnitude of these positive effects depends on site-specific factors such as the degree of degradation and local peat characteristics, all studies have shown an overall long-term decrease in pollutant concentrations (Negassa et al., 2020).

It is worth noting that some studies have shown a short-term increase in phosphorous and suspended solid concentrations following restoration (Harpenslager et al. 2015 and Koskinen et al, 2017). This short-term increase in pollutants is linked to initial drain-blocking activities before the hydrogeological regime of the Application Site becomes stabilised (Pschenyckyj. C. et al. 2021).

The rehabilitation has also improved water attenuation at the Application Site, with the blocked drains slowing the rate at which water moves through the Application Site and the rate at which water enters downgradient rivers.

Water still discharges from the designated emission points downgradient of the silt ponds. However, as discussed in the above paragraphs, this discharge will be of improved quality and of lower volumes.

Pathway: Site drainage and surface water discharge routes.

Receptor: Surface water quality and quantity in the receiving streams (Breagagh River, North Glengoole Stream, Clover River, Black (Two Mile Borris) River, Drish River and all associated tributaries and water-dependent ecosystems.

Assessment of effects in the absence of control measures: The pre-mitigation potential effect is considered to be a positive, indirect, slight, long-term, likely effect on downstream surface water quality/quantity.

8.6.2.3 Contamination of Groundwater by Leakages and Spills

Despite the cessation of peat extraction at the Application Site, there was still some limited activity at the Application Site, associated with the removal of stockpiles and railway infrastructure (site decommissioning) and the Rehabilitation Phase 1works. These works involved machinery and plant with which there is always a risk of accidental spillage of hydrocarbons. Similarly, the office buildings remained occupied and discharges from wastewater systems (septic tanks) etc. had the potential to cause surface water and groundwater contamination. These risks are the same as those outlined for Peat Extraction Phase but to a lesser extent due to the lower volumes of plant, machinery and workers operating at the site during the Current Phase.

Pathway: Infiltration through pore space in peat, subsoil and bedrock.

Receptor: Local Groundwater Quality.

Assessment of effects in the absence of control measures: Even in the absence of control measures there would have been no significant effects on local groundwater quality due to the hydrogeological characteristics of the Application Site. The effect would have been the same as that described in Section 8.8.2.3 i.e. a negative, imperceptible, short-term, indirect unlikely effect on groundwater quality.

8.6.2.4 Contamination of Surface Water by Leakages and Spills

Despite the cessation of peat extraction at the Application Site, there has been some activity at the Application Site during the Current Phase, associated with the removal of stockpiles and railway infrastructure (site decommissioning) and the Rehabilitation Phase 1works. These works involved machinery and plant with which there is always a risk of accidental spillage of hydrocarbons. Similarly, the office buildings remained occupied and discharges from wastewater systems (septic tanks) etc. had the potential to cause surface water and groundwater contamination. These risks are the same as those outlined for the Peat Extraction Phase but to a lesser extent due to the lower volumes of plant, machinery and workers operating at the Application Site during this phase.

Pathway: Overland flow and site drainage network.

Receptor: Surface water quality in the receiving streams (Breagagh River, North Glengoole Stream, Clover River, Black (Two Mile Borris) River, Drish River and all associated tributaries and water-dependent ecosystems).

Assessment of effects in the absence of control measures: Even in the absence of control measures there would have been no significant effects on downstream watercourses due to the restricted nature of the works completed in this phase. However, in the absence of control measures relating to hydrocarbons, the effect would have been greater than that described in Section 8.8.2.4. The effect would have been a negative, slight, short-term, indirect, unlikely effect on surface water quality.

8.6.2.5 Effects of Fertiliser Application on Downstream Surface Water Quality

The Rehabilitation Phase 1 works included some fertiliser treatment in Derryvella Bog whilst the ongoing Rehabilitation Phase 1 works also included fertiliser application at Littleton, Lanespark and Longfordpass bogs where required - in some instances where the cutaway bog is slow to colonise naturally, and where it is considered to be more advantageous to speed up the vegetation process, an application of a once-off fertiliser treatment can help accelerate the establishment of vegetation. Long-term continuous or recurring fertiliser application is not proposed.

The application of fertilizer has the potential to enrich downstream surface waters and have a negative impact on local surface water quality.

Pathway: Site drainage and surface water discharge routes.

Receptor: Surface water quality and quantity in the receiving streams (Breagagh River, North Glengoole Stream, Clover River, Black (Two Mile Borris) River, Drish River and all associated tributaries and water-dependent ecosystems).

Pre-Mitigation Potential Effect: The pre-mitigation potential effect is considered to be a negative, indirect, imperceptible, short-term, unlikely effect on downstream surface water quality.

8.6.2.6 Effects on Groundwater Abstractions

Local groundwater resources are characterised in Section 8.4.13.2, with no groundwater supplies mapped within the Application Site boundaries.

The works completed during the Current Phase, comprising of the removal of stockpiles and railway infrastructure (site decommissioning) and the Rehabilitation Phase 1 Works were all near-surface activities. Therefore, the potential to impact local groundwater supplies (quality and quantity) is negligible. Furthermore, the Application Site is underlain by subsoils of low permeability which significantly restrict groundwater recharge.

Pathway: Groundwater recharge and groundwater flow paths and site drainage network.

Receptor: Groundwater quality and groundwater quantity in local groundwater well supplies.

Pre-Mitigation Potential Effect: The pre-mitigation potential for effects is considered to be a negative, indirect, imperceptible, short-term, very unlikely effect on local groundwater wells.

8.6.2.7 Effect on Designated Sites

Despite the cessation of peat extraction at the Application Site, there has been some activity at the Application Site during the Current Phase, associated with the removal of stockpiles and railway infrastructure (site decommissioning) and the Phase 1 Rehabilitation works.

The Application Site remains hydrologically linked with the Lower River Shannon SAC and the Cabragh Wetlands pNHA. The risks to the receiving waters (in terms of water quantity and water quality) are the same as those outlined in Section 8.6.1.7 but to a much lesser extent due to the lower intensity of works being completed at the Application Site. Less activity on-site has decreased the likelihood of pollution incidents or exceedances of discharge limits occurring. The risk is much reduced in comparison to the Peat-Extraction Phase of the Project.

Similar to the Peat Extraction Phase, the greatest potential for effects occurred in the receiving streams. Further downstream, the River Suir was less susceptible to potential effects due to the large flow volumes in this river. Nevertheless, the Current Phase of the Project did not rely on the dilution or assimilative capacity of any downstream watercourse. The control measures implemented in this phase, associated with the IPC licences, ensured that there would be no negative effect on any watercourse downstream of the Application Site.

Furthermore, the Rehabilitation Phase 1 works will likely improve the quality of aquatic ecosystems which are upstream of these designated sites. However, the significant of any positive effects on the Lower River Suir SAC and the Cabragh Wetlands pNHA will be limited given their distant location from the Application Site and the large volumes of water within the River Suir.

Pathway: Surface water drainage network. Drainage from the Application Site discharges to outfall points and streams, which discharge to the Drish River which in turn discharges into the River Suir.

Receptor: Lower River Suir SAC and the Cabragh Wetlands pNHA.

Assessment of effects in the absence of control measures: The pre-mitigation potential effect is considered to be a positive, indirect, imperceptible, long-term effect on downstream designated sites.

8.6.2.8 Effects on WFD Status of Surface and Groundwater Bodies

With the cessation of peat extraction, there was less potential for disturbance of peat and elevated concentrations of suspended sediments entering surface watercourses. Similarly, the activity of machinery and plant has been reduced, therefore lowering the potential occurrence of accidental spillages of hydrocarbons.

During this period the site drainage still operated under the same drainage systems as during the operational phase of peat extraction i.e. field drains, main drains, silt ponds and discharge outlets etc. The Rehabilitation Phase 1 n works will have reduced discharge volumes from the Application Site. The Rehabilitation Phase 1 works will have had a positive effect on downstream surface water quality and quantity (flow volumes).

All works completed during the Current Phase were shallow, near surface works, and there was no potential to impact the status of the underlying Thurles or Templemore GWBs.

Pathway: Surface water discharge.

Receptor: Downstream SWBs.

Assessment of effects in the absence of control measures: Due to the reduced activity at the Application Site, we consider that the effect in the absence of control measures would have been similar to the residual effect described in Section 8.8.2.8 i.e. a positive, imperceptible, short-term, indirect, unlikely effect on WFD status of downstream SWBs. There would have been no effect on the underlying GWBs.

8.6.3 Remedial Phase

8.6.3.1 Effect on Bog Hydrogeological Regime

The Rehabilitation Phase 2 works proposed for Derryvella Bog include targeted drain blocking to help establish a more suitable hydrological/hydrogeological regime where the peat water table will be much closer to the surface than it is at present.

No Phase 2 Rehabilitation works are proposed for Littleton, Lanespark or Longfordpass bogs however some measures are ongoing at these bogs under Rehabilitation Phase 1, including revegetation and monitoring which are detailed in Table 4-8 of Chapter 4 - Description of the Development, Volume 2. The ongoing works in Littleton, Lanespark and Longfordpass bogs have no potential to have significant effects on local hydrogeology within these peat bogs.

Pathways: Water volume and peat water level rise.

Receptors: Local peat bog hydrology/hydrogeology.

Pre-Mitigation Potential Effect: The pre-mitigation potential effect is considered to be a positive, direct, moderate, permanent likely effect on the bog hydrogeological regime within the Application Site.

8.6.3.2 Effect on Downstream Surface Water Quality

The additional drain blocking and hydrological management at Derryvella Bog will result in improvements in flow and water quality through the proposed enhanced bog rehabilitation and rewetting. The positive effects are similar to those described in Section 8.6.2.2 above.

Pathway: Site drainage and surface water discharge routes.

Receptor: Surface water quality and quantity in the receiving streams (North Glengoole Stream and the Black (Two Mile Borris) River.

Pre-Mitigation Potential Effect: The pre-mitigation potential effect is considered to be a positive, indirect, slight, long-term, likely effect on downstream surface water quality/quantity.

8.6.3.3 Effect of Potential Leakages and Spillages on Groundwater Quality

During the Remedial Phase, there will be some activity at the Application Site involving machinery and plant with which there is always a risk of accidental spillage of hydrocarbons. This activity will be greatest during the initial stages of the Rehabilitation Phase 2 works associated with rewetting and revegetation such as drain blocking at Derryvella Bog. Once this work has been completed there will only be very limited activity at the Application Site which will mainly comprise of non-intrusive monitoring and minimal repairs to peat blockages and or additional fertilization to aid the development of successional vegetation communities. The risk of hydrocarbon spillage will not be restricted to Derryvella Bog but will be present across the Application Site due to the ongoing monitoring in Littleton, Lanespark and Longfordpass bogs as part of the Rehabilitation Phase 1 works.

Pathway: Site drainage networks and groundwater flowpaths.

Receptor: Local groundwater quality.

Pre-Mitigation Potential Effect: The pre-mitigation potential effect is considered to be a negative, indirect, slight, short-term, unlikely effect on local groundwater quality.

8.6.3.4 Effect of Potential Leakages and Spillages on Surface Water Quality

Same as Section 8.6.3.3 above.

Pathway: Overland flow and site drainage network.

Receptor: Surface water quality and quantity in the receiving streams (Breagagh River, North Glengoole Stream, Clover River, Black (Two Mile Borris) River, Drish River and all associated tributaries and water-dependent ecosystems).

Pre-Mitigation Potential Effect: The pre-mitigation potential effect is considered to be a negative, indirect, significant, short-term, unlikely effect on downstream surface water quality.

8.6.3.5 Effects of Fertiliser Application on Downstream Surface Water Quality

The Rehabilitation Phase 2 works proposed for Derryvella Bog include the targeted application of fertiliser to bare peat areas of headlands, high peat fields and other areas (where required - in some instances where the cutaway bog is slow to colonise naturally, and where it is considered to be more advantageous to speed up the vegetation process, an application of a once-off fertiliser treatment can help accelerate the establishment of vegetation). Long-term continuous or recurring fertiliser application is not proposed.

As part of the ongoing Rehabilitation Phase 1 works, fertiliser application may be required at Littleton, Lanespark and Longfordpass bogs where natural re-colonisation has been deemed to be unsatisfactory.

The application of fertilizer has the potential to enrich downstream surface waters and have a negative impact on local surface water quality.

Pathway: Site drainage and surface water discharge routes.

Receptor: Surface water quality and quantity in the receiving streams (Breagagh River, North Glengoole Stream, Clover River, Black (Two Mile Borris) River, Drish River and all associated tributaries and water-dependent ecosystems).

Pre-Mitigation Potential Effect: The pre-mitigation potential effect is considered to be a negative, indirect, imperceptible, short-term, unlikely effect on downstream surface water quality.

8.6.3.6 Effect on Groundwater Abstractions

Local groundwater resources are characterised in Section 8.4.13.2, with no groundwater supplies mapped within the Application Site.

The works associated with the Rehabilitation Phase 2 works at Derryvella Bog, and the ongoing Rehabilitation Phase 1 works at Littleton, Lanespark and Longfordpass bogs, are all near-surface activities. Furthermore, the bog is underlain by subsoils of low permeability which restrict groundwater recharge Therefore, the potential to impact local groundwater supplies (quality and quantity) is negligible.

Pathway: Groundwater recharge and groundwater flow paths and site drainage network.

Receptor: Groundwater quality and groundwater quantity in local groundwater well supplies.

Pre-Mitigation Potential Effect: The pre-mitigation potential for effects is considered to be a negative, indirect, imperceptible, short-term, very unlikely effect on local groundwater wells.

8.6.3.7 Effect on Downstream Designated Sites

Peatlands and downstream terrestrial aquatic ecosystems are directly linked and while the degradation of the Application Site may have caused a deterioration in habitats and reduced levels of biodiversity in the downstream catchment, the enhanced rewetting and rehabilitation of Derryvella Bog is linked with improved surface water quality. Therefore, the proposed Rehabilitation Phase 2 works at Derryvella Bog will likely improve the quality of local aquatic ecosystems. However, the significant of any positive effects on downstream designated sites will be limited given their distant location from the Application Site and the large volumes of water within the River Suir. Similarly the ongoing Rehabilitation Phase 1 works at Littleton, Lanespark and Longfordpass bogs, will have no potential for significant effects on downstream designated sites due to the minor nature of these works.

Pathway: Surface water drainage network.

Receptor: Lower River Suir SAC and the Cabragh Wetlands pNHA.

Pre-Mitigation Potential Effect: The pre-mitigation potential effect is considered to be a positive, indirect, imperceptible, long-term effect on downstream designated sites.

8.6.3.8 Effect on Surface and Groundwater Body WFD Status

The EU Water Framework Directive (2000/60/EC) requires that all member states protect and improve water quality in all waters, with the aim of achieving good status by 2027 at the latest. Any new development must ensure that this fundamental requirement of the Directive is not compromised. Therefore, the Remedial Phase of the Project must not compromise the objectives of the WFD.

The status of the GWBs and SWBs in the vicinity and downstream of the Application Site are described in Section 8.4.11.

Potential effects on groundwater and surface water quality and quantity as a result of the Remedial Phase, in the absence of mitigation measures has the potential to result in a short-term deterioration in the WFD status of surface water bodies in the immediate vicinity of Derryvella Bog. This short-term impact will be associated with the short-term actions phase of the Rehabilitation Phase 2 works during which drain blocking and fertiliser application will be completed. However, even in an unmitigated scenario, the long-term effects of the Rehabilitation Phase 2 works will have a positive impact on the WFD status of surface waterbodies in the vicinity of the Derryvella Bog due to the improved quality of surface water discharge from the site and the improved water attenuation within the bog. Similarly the ongoing Rehabilitation Phase 1 works at Littleton, Lanespark and Longfordpass bogs, will have no potential to alter the WFD status of downstream SWBs due to the minor nature of these works.

The proposed activities on the Application Site during the Remedial Phase will be limited to near surface activities and due to the local hydrogeological regime of the site being characterised by low groundwater recharge rates, the potential for the Project to impact on the status of the underlying GWBs is negligible.

A full WFD Compliance Assessment is included as Appendix 8-2, Volume 3. Our understanding of the WFD objectives is that water bodies, regardless of whether they have 'Poor' "Moderate" or 'High' status, should be treated the same in terms of the level of protection and mitigation measures employed in order to ensure there is no deterioration in the status of a waterbody.

Pathway(s): Surface water drainage and downstream discharge to SWBs. Groundwater recharge to the underlying GWB.

Receptor: Downstream SWBs and underlying GWBs.

Pre-Mitigation Potential Effect: The pre-mitigation potential effect is considered to be a positive, indirect, slight, long-term effect on the receiving SWBs. The pre-mitigation potential effect is considered to be a neutral effect on the underlying GWB.

8.7 Control and Monitoring Measures

8.7.1 Peat Extraction Phase (July 1988 – 2017)

8.7.1.1 Effects of Bog Drainage on Bog Hydrogeology

The following measures were in place to mitigate against the effects of groundwater drainage of the bog on the bog hydrogeology:

- Field drains with low gradients and shallow depths (<1.0m);
- Silt ponds, as well as being a control measure for sediment from the bog, also acted as attenuation measures for higher flows during peak rainfall events. Each metre length of silt pond provides ~12m^3 of water storage, which aided in slowing down the discharge from the bog units;
- Silt ponds were cleaned at least twice a year to maintain adequate storage and treatment (sedimentation/settlement) capacity; and,
- Pipeline capacities were designed based on a runoff rate of 1.7l/s/Ha, which is equivalent to the greenfield runoff rates.

Following drainage of the bogs they would no longer have been suitable for most natural bog vegetation. As the bogs were already drained by 1988, the effect of continuing peat extraction activities until 2017 would not have resulted in any major alteration of the local hydrogeological regime. The groundwater tables in these bogs had already been lowered during their initial draining which pre-dated 1988 and the hydrogeological regime at these bogs would already have been unsuitable for most bog communities. Only minor annual changes would have occurred during this phase of the Project.

8.7.1.2 Effects of Bog Drainage on Downstream Surface Water Hydrology/Quality

Pre-IPC Licence Control Measures:

Prior to the regulation of activities at the Littleton Bog Group by the EPA which commenced in 2001, the Applicant was implementing several control measures to protect surface water quality in downstream waterbodies. These measures primarily relate to the concentrations of suspended sediments in discharge from the bog and are summarised below:

- Internal drains cleaned on a regular basis in suitable weather. This was completed to remove sludge from the bottom of ditches, allowing them to retain full functionality. The sludge was disposed of by spreading it on the adjacent production fields where it was dried and harvested;
- Drain maintenance was carried out using draglines and excavators, ensuring that these drains were fit for purpose;
- Drain maintenance was carried out mainly prior to and post the harvesting season.
- Silt ponds were utilised to control the amount of sediment being discharged at outfalls. At this time, silt ponds were designed for an upper limit of 100mg/l suspended sediment;
- Silt ponds were upgraded in the 1990s to cater for the settling of sufficient amount of silt. This often included the construction of a second silt pond adjacent to the first, which was used as a backup and to facilitate desludging of the primary pond; and,
- Silt ponds were de-sludged twice per annum.

Active IPC Licence:

The Application Site has been regulated by the EPA under IPC Licence Registration No. P0499-01 since 2001. The Littleton Bog Group also has a Surface Water Management Plan which defines how compliance with the Licence is achieved. The drainage system in place at the bog comprises field drains, main drains, piped drains, silt ponds upstream of outfall locations, is designed to prevent the release of elevated concentrations of suspended sediments into nearby surface waterbodies. As part of the IPC Licence, there is a limit of 35mg/l for suspended solids. Monitoring shows that the discharges from the Application Site have been largely compliant with regards to suspended solids.

Existing control measures which were implemented under the IPC licence are also designed to limit runoff rates from the bog units. These include:

- Silt ponds providing attenuation limited runoff during periods of intense rainfall; and,
- Continuous mitigation included maintaining the schedule of cleaning the silt ponds at a minimum of twice per year.

8.7.1.3 Contamination of Groundwater by Leakages and Spills

Pre-IPC Licence Control Measures:

Prior to the regulation of activities at the Application Site by the EPA which commenced in 2001, the Applicant was implementing several control measures to reduce the risk of contamination by spills and leakages. These measures primarily relate to the storage of peat harvesting machinery, refuelling procedures and waste management. These measures are summarised below and outlined in full in Chapter 4 - Description of Development, Volume 2 at Section 4.6:

- All fuels were stored in above ground tanks alongside the main workshop at the Littleton works. These fuel tanks were bunded. The practice of bunding at the Works and for mobile refuelling was introduced at the Application Site in the 1970s;
- All machinery were stored at the Littleton Works at the end of each workday or at local holding areas around the Application Site;
- All machinery were regularly inspected, serviced and cleaned. Cleaning was completed at a wash bay which drained towards an interceptor tank and associated soak pit;
- Refuelling and maintenance of all vehicles were undertaken at Littleton Works, or at local holding areas in Longfordpass and Littleton bogs;
- When machinery required refuelling on the Application Site, it was carried out by a mobile (rail or tractor-transported) fuelling unit which travelled out from Littleton Works to the bogs where the machinery was located;
- In the event of an emergency spill, the following procedures were in place:
    - The General Manager (GM) was immediately informed of the incident.
    - The spill was assessed by the GM to assess the potential for environmental and/or health consequences.
    - The spill would have been sourced, isolated and contained with polystyrene booms or dry peat.
    - Every effort would have been made to prevent the spill from entering the nearest drain or outfall.
    - Once the spill was contained, a suitable absorbent (typically dry peat) was used to soak the spillage.
    - Follow up measures were taken to prevent such a spillage recurring in the future.
    - In the event of a spillage the GM notified the local authority.
- All waste oil and break fluids drained from machinery were collected in drums and emptied into a waste oil storage tank which were transported off-site by a licenced disposal contractor;
- All used oil and fuel filters and used batteries were collected by licenced disposal and battery collection contractors respectively; and,
- All washing from the self-contained machine parts washer was collected within a sludge tank at the Littleton Works.

Active IPC Licence:

The refuelling procedures and control measures implemented by the Applicant were upgraded and enhanced in order to comply with IPC licence conditions with the Application Site being regulated by the EPA under IPC Licence Registration No. P0499-01 since 2001. The bog also has a Surface Water Management Plan[1] which define how compliance with the Licences is achieved. No additional control measures, other than compliance with the control measures regulated by the EPA, are considered necessary in terms of protecting groundwater quality. The list below outlines control measures conditioned under the IPC licencing regime, as regulated by the EPA:

- Effective spill/leak management of mobile fuelling units was undertaken;
- Replacement (and remediation where necessary) of all underground fuel tanks was undertaken;
- There was no other emissions to water of environmental significance;
- All tank and drum storage areas were rendered impervious to the materials stored therein. In addition, tank and drum storage areas was bunded;
- Drainage from bunded areas was diverted for collection and safe disposal;
- The integrity and water tightness of all the bunding structures and their resistance to penetration by water or other materials stored therein was tested and demonstrated by the licensee to the satisfaction of the Agency and shall be reported to the Agency within eighteen months from the date of grant of this licence and every two years thereafter;
- The loading and unloading of fuel oils was carried out in designated areas protected against spillage and leachate run-off;
- While awaiting disposal, all materials were collected and stored in designated areas protected against spillage and leachate run-off;
- Except for roof water, all surface water discharges from workshop areas were fitted with oil interceptors;
- An inspection for leaks on all flanges and valves on over-ground pipes used to transport materials other than water was carried out weekly;
- The Applicant undertook a programme of testing and inspection of underground fuel pipelines to ensure that all underground fuel lines were tested at least every three years; and,
- The Applicant maintained (in storage) an adequate supply of containment booms and/or suitable absorbent material to contain and absorb any spillage.

8.7.1.4 Contamination of Surface Water by Leakages and Spills

Pre-IPC Licence Control Measures:

Prior to the regulation of activities at the Application Site by the EPA which commenced in 2001, Bord na Móna were implementing several control measures to reduce the risk of contamination by spills and leakages. These measures primarily relate to the storage of peat extraction machinery, refuelling procedures and waste management. These measures are the same as those outlined in Section 8.7.1.3.

[1] Current versions: SWMP 0501 Derrygreenagh 31.01.2020.pdf

Active IPC Licence:

The Application Site has been regulated by the EPA under IPC Licence Registration No. P0499-01 since 2001. The bog also has a Surface Water Management Plan which define how compliance with the Licences is achieved. The control measures implemented to reduce to the risk of contamination by spills and leakages are the same as those outlined in Section 8.7.1.3.

8.7.1.5 Effects Associated with Supporting Infrastructure

Surface water run-off from Littleton Works and hard standing areas drained via onsite surface water drainage systems, which were installed as part of the construction of these infrastructures, into the adjacent peatland drainage system. 2 no. hydrocarbon interceptors were present at Littleton Works which facilitated the removal of oil from water drainage the refuelling areas or wash bays.

All mitigation measures in relation to refuelling are detailed above in Section 8.7.1.3.

The potable water supply at Littleton Works is from a local authority water supply mains located on the L4101 and had no potential to effect the local water environment.

Wastewater from the welfare facilities at Littleton Works received primary treatment in one of three septic tanks at the Works, with the effluent discharging to ground via soakaways. The septic tanks were visually inspected and cleaned bi-annually by a licenced waste permit holder to ensure the treatment system was working optimally. There was no discharge of untreated wastewater associated with the welfare facilities.

8.7.1.6 Effects on Groundwater Abstractions

Control Measures: No control measures would be necessary due to the shallow nature of the works and the nature of the local hydrogeological regime.

8.7.1.7 Effects on Designated Sites

As outlined above the Application Site has been regulated by the EPA under IPC Licence Registration No. P0499-01 since 2001. In addition, the drainage system has been designed to limit runoff from the site via low-gradient field drains, mains drains, and silt ponds. Control measures relating to the protection of water quality are outlined in Section 8.7.1.1 to 8.7.1.4 above.

Although surface pathways exist between the Application Site and the Lower River Suir SAC and the Cabragh Wetlands pNHA, the scale of flows from the Application Site is small relative to the scale of flows in the designated site (associated with the River Suir). Surface water flows between 0.01 – 0.1m^3/s were classified within bog scale flows while sub-catchment to catchment scales flows were classified as being within 10 – 100+ m^3/s. The surface water connections between the Application Site and the SAC/pNHA are greater than 17km in length and transition from bog scale flows near the bog to sub-catchment and catchment scale of flows at the SAC/pNHA boundaries (i.e. the Drish River discharges to the River Suir which has a much higher volumetric flow).

There are also other activities in all catchments upstream and downstream of the Application Site that have and will contribute to changes in flows and changes in water quality in the receiving water environment (i.e. agriculture, forestry etc).

8.7.1.8 Effect on the WFD Status of Surface and Groundwater Bodies

Since 2001, the peat extraction and ancillary activities at the Application Site were completed under the conditions set out in IPC Licence No. P0499-01. This IPC Licence came into effect in August 2001 and upgraded and enhanced several pre-existing environmental monitoring and control measures which had been implemented at the Application Site since July 1988. These pre-IPC measures largely included the incorporation of silt ponds into the bog drainage system to minimise the concentrations of suspended solids entering local watercourses. Further amendments were made to the IPC conditions in 2003 following the required transposition of the WFD into Irish Law. The bog group also has a Surface Water Management Plan which define how compliance with the Licences is achieved. Therefore, throughout the Peat Extraction Phase of the Project, peat extraction and ancillary activities have been operating under strict conditions designed to protect downstream water quality and quantity.

Control measures relating to the protection of water quality are outlined in Section 8.7.1.1 to 8.7.1.4 above.

8.7.2 Current Phase (2017 – Present Day)

8.7.2.1 Effects of Bog Drainage on Bog Hydrogeology

During this period Bord na Móna continued to operate the Application Site in accordance with IPC licensing requirements. No further control measures, beyond that implemented to date, are deemed necessary as the conditions, emission limits etc. set out in the IPC licence are designed in accordance with the relevant legislation to ensure ongoing protection of ground and surface waters.

No specific mitigation measures were required in relation to the Rehabilitation Phase 1 works as the measures will have a positive effect on the bog hydrogeology. All works were completed in accordance with the 'best practice' procedures and the mitigation measures in relation to the protection of surface and groundwater quality. The methods are fully described in the Irish Wildlife Manual, Best Practice in Raised Bog Restoration in Ireland (Mackin et al, 2017).

8.7.2.2 Effects of Bog Drainage on Downstream Surface Water Hydrology

During this period the Application Site continued to operate under IPC licensing requirements with respect to surface water discharge quality and quantity.

8.7.2.3 Contamination of Groundwater by Leakages and Spills

Measures that mitigated against contamination of groundwaters are outlined in Section 8.7.1.3 and are currently being adhered to at the Application Site.

8.7.2.4 Contamination of Surface Water by Leakages and Spills

Measures that mitigated against contamination of surface waters are outlined in Section 8.7.1.4 and are currently being adhered to at the Application Site.

8.7.2.5 Effects of Fertiliser Application on Downstream Surface Water Quality

Mitigation measures with regard to fertilizer application included:

- Fertiliser was not applied on land which was waterlogged, flooded, likely to flood, frozen or covered with snow;
- No fertiliser was applied during heavy rain;
- No fertiliser was applied on steeply sloping ground or where there was a risk of water pollution (i.e. the presence of drains); and,
- No fertiliser was spread on land within 2m of a surface watercourse.

Buffer zones, in accordance with EPA guidelines (www.epa.ie), were utilised and adhered to in respect of waterbodies during fertiliser application.

8.7.2.6 Effects on Groundwater Abstractions

Any works during this time period have been completed under licence from the EPA and Bord na Móna's Environmental Management System.

8.7.2.7 Effect on Designated Sites

Any works during this time period have been completed under licence from the EPA and Bord na Móna's Environmental Management System.

The only works completed comprised minor maintenance and minor repairs to the drainage network and silt ponds where required.

8.7.2.8 Effects on WFD Status of Surface and Groundwater Bodies

During this period the Application Site continued to operate under IPC licensing requirements with respect to surface water discharge quality and quantity.

8.7.3 Remedial Phase

8.7.3.1 Effect on Bog Hydrogeological Regime

No specific mitigation measures are required in relation to the proposed alteration of the existing bog hydrogeology as the proposed measures will have a positive effect on the bog hydrogeology.

Any works undertaken as part of the rehabilitation plan will be completed under licence from the EPA with Bord na Móna reporting to the EPA until the IPC Licence is surrendered. All works completed during the Remedial Phase will be done in accordance with 'best practice' procedures and the mitigation measures in relation to the protection of surface and groundwater quality are detailed in Section 8.7.3.2 to Section 8.7.3.5 below.

8.7.3.2 Effect on Downstream Surface Water Quality

Any works undertaken as part of the Rehabilitation Phase 2 will be completed under licence from the EPA with Bord na Móna reporting to the EPA until the IPC Licence is surrendered.

The existing drainage systems and silt control measures, which have proven effect, will continue to operate during the early stages of the works when there is the potential for the entrainment of suspended solids in surface waters during drain blocking. During this time no remedial works will be completed during periods of prolonged rainfall. Silt ponds will continue to be in use and will be regularly inspected and maintained as per IPC licence requirements. All onsite activities will be completed in accordance with 'best practice' procedures.

Following implementation of the rehabilitation measures a programme of aftercare and maintenance, designed in accorded to meet the Conditions of the IPC Licence, will be completed at the Application Site. This will comprise of initial quarterly monitoring, with the number of site visits reducing after 2 years to bi-annually and then after 5 years to annual visits. A water quality monitoring program will be established to monitor the impact of rehabilitation on water quality discharge from the bog. The monitoring results will be reported on each year to the EPA with the parameters to be included as follows: monthly monitoring for pH, Suspended Solids, Total Solids, Total Phosphorus, Total Ammonia, Colour, and COD and DOC.

8.7.3.3 Effect of Potential Leakages and Spillages on Groundwater Quality

The following environmental control measures will be implemented during the Remedial Phase in order to mitigate against leaks and spills:

- All machinery will be regularly checked and maintained prior to arrival at the site;
- Fuelling and lubrication of equipment will only be completed in designated areas and away from surface water features;
- Vehicles will never be left unattended during refuelling;
- All refuelling will occur in mobile fuel bowsers;
- Only dedicated, trained and competent personnel will complete refuelling operations;
- Fuel bowsers will be bunded to 100% capacity to prevent any spills;
- Storage tanks for bowsers and generators will be double-skinned;
- Waste oils and fluids will be collected in leak proof containers and removed from the site for disposal;
- Spill kits will be kept on site; and,
- All activities will be completed in accordance with current 'best practice' procedures.

8.7.3.4 Effect of Potential Leakages and Spillages on Surface Water Quality

The mitigation measures outlined in Section 8.7.3.3 will be implemented and adhered to through the Remedial Phase of the Project and until the IPC Licence for the Application Site is surrendered. These measures significantly decrease the risk of surface water contamination by leaks and spills of hydrocarbons. No further mitigation measures are deemed necessary.

8.7.3.5 Effects of Fertiliser Application on Downstream Surface Water Quality

Mitigation measures with regard to fertilizer application include:

- Fertiliser will not be applied on land which is waterlogged, flooded, likely to flood, frozen or covered with snow;
- No fertiliser will be applied when heavy rain is forecast within the succeeding 48 hours;

- No fertiliser will be applied on steeply sloping ground or where there is a risk of water pollution (i.e. the presence of drains); and,
- No fertiliser will be spread on land within 2m of a surface watercourse.

Buffer zones, in accordance with EPA guidelines (www.epa.ie), will be utilised and adhered to in respect of waterbodies during fertiliser application.

8.7.3.6 Effect on Groundwater Abstractions

With the exception of the protection of groundwater quality from the accidental spillages of hydrocarbons as discussed in Section 8.7.3.3, no additional mitigation measures would be necessary due to the shallow nature of the works and the nature of the local hydrogeological regime.

8.7.3.7 Effect on Downstream Designated Sites

Any works during this time period have been completed under licence from the EPA and Bord na Móna's Environmental Management System. These mitigation measures outlined in Sections 8.7.3.2 to Section 8.7.3.5. The mitigation measures outlined above will be implemented and adhered to until the IPC Licence for the Application Site is surrendered.

8.7.3.8 Effect on Surface and Groundwater Body WFD Status

Due to the hydrogeological regime at the Application Site, the surface waterbodies directly downstream of the bog discharge locations are deemed to be the most sensitive receptors.

Strict mitigation measures in relation to the protection of surface and groundwaters are outlined above in Section 8.7.3.2 to 8.7.3.5. The implementation of these mitigation measures during the Remedial Phase will ensure the qualitative and quantitative status of the receiving surface and groundwaters will not be altered.

Consequently, there will be no change in GWB or SWB status in the underlying GWBs or downstream SWBs. There will be no change in quantitative (volume) or qualitative (chemical) status, and the downstream SWBs are protected from any potential deterioration from chemical pollution.

As such, the Remedial Phase is compliant with the requirements of the Water Framework Directive (2000/60/EC).

8.8 Residual Effects

8.8.1 Peat Extraction Phase (July 1988 - 2017)

8.8.1.1 Effects of Bog Drainage on Bog Hydrogeology

The residual effect of Peat Extraction Phase of the Project is a permanent, moderate, negative, direct, long-term likely effect on the bog hydrogeology. The Rehabilitation Phase 1 works completed during the Current Phase, comprised of extensive drain blocking in order to raise the subsurface water levels within the bogs. The assessment of the implementation of these measures is provided in Section 8.8.2.1.

With the implementation of the control measures, we consider that there has been a slight, negative, long-term, direct effect on local bog hydrogeology as a result of the Peat Extraction Phase of the Project between July 1988 and 2017.

8.8.1.2 Effects of Bog Drainage on Downstream Surface Water Hydrology/Quality

All activities pre-dating 2001 were unlicensed and no records exist regarding the quality of discharges to nearby surface watercourses. However, by 1988 peat extraction and ancillary activities were already well established at the Application Site and while EPA Q-values throughout this phase of the Project fluctuate, there is no clear negative trend in terms of surface water quality between 1988 and 2017. Some improved sediment control measures were installed at the Application Site in the late 1990s and early 2000s and water quality discharge licence limits have been in place since 2001 in accordance with IPC licensing. The available monitoring data indicate that improvements in downstream water quality have not been significant, and this is because there are other activities in the catchment that effect water quality (agriculture and forestry). However, it is noted that no Bad Q-status is recorded downstream of the Application Site since 1999.

Overall the baseline water quality did not change significantly during the Peat Extraction Phase. It is noted that there was a slight deterioration in Q-ratings at some EPA monitoring stations on the Breagagh River in the early Peat Extraction Phase but no EPA monitoring has been completed on this watercourse since 1992. The Q-ratings on the Black (Two Mile Borris) River fluctuate slightly, but no overall negative trend in water quality can be observed from the EPA monitoring results. The EPA monitoring stations on the Clover River recorded an improved Q-rating during the Peat Extraction Phase. Meanwhile, a slight deterioration was recorded at some stations along the Drish River.

The effect on surface water quantity in downstream surface watercourse are not likely to have been significant and the changing Q-ratings likely represent wider issues in the overall catchment to these watercourses. The drainage systems were designed to reduce runoff to greenfield runoff rates. In addition, runoff from intact raised peat bogs can be quite high when saturated during the winter months.

The residual effect is a moderate, long-term, negative and indirect likely effect on downstream surface water quality and a moderate, long-term, negative and indirect effect on downstream surface water quantity (i.e. river flows).

The cessation of activities and the implementation of the rehabilitation plans limit the potential for significant effects into the future and this is assessed below.

For the reasons outlined above and with the implementation of the control measures we consider that there has not been a significant effect on groundwater quality as a result of leaks and spills during the Peat Extraction Phase of the Project.

8.8.1.3 Contamination of Groundwater by Leakages and Spills

From a review of the AER reports, we understand that no significant fuel spills or wastewater discharges have occurred since 2001. Where spills were recorded, they are noted to have been minor and remediation works were undertaken. In addition, extensive control measures have been implemented since 2001 as part of the IPC licence which mitigates against the possibility of any groundwater contamination.

While there are no records to rely on, there does not appear to be any significant issues with hydrocarbons or wastewater discharges to groundwater resulting from the peat extraction works prior to IPC regulation (we note that no major issues are referenced in the IPC licence application or in subsequent annual environmental reports).

Therefore, the residual effect on local groundwater quality is imperceptible, long-term, negative, indirect and unlikely.

For the reasons outlined above and with the implementation of the control measures we consider that there has not been a significant effect on groundwater quality as a result of leaks and spills during the Peat Extraction Phase of the Project.

8.8.1.4 Contamination of Surface Water by Leakages and Spills

Bord na Móna did not record (in annual AER submissions to the EPA) the occurrence of any major significant fuel spills and/or wastewater discharges. Where spills were recorded, they are noted to have been minor and remediation works were undertaken. In addition, extensive control measures have been implemented since 2001 as part of the IPC licence which mitigate against the possibility of any surface water contamination.

While there are no pre-IPC licence records to rely on, there is no evidence of any significant issues with hydrocarbons or wastewater discharges to surface waters resulting from the peat extraction and ancillary activities prior to IPC regulation.

The residual effect is a slight, long-term, negative, indirect, unlikely effect on local surface water quality and downstream aquatic ecosystems.

For the reasons outlined above and with the implementation of the control measures, it is considered that there has not been a significant effect on downstream surface water quality as a result of leaks and spills during the Peat Extraction Phase of the Project.

8.8.1.5 Effects Associated with Supporting Infrastructure

The potential for effects associated with the supporting infrastructure is limited due to their small scale of within the wider the Application Site. Furthermore, all activities at the Application Site were completed using control measures designed to ensure the protection of downstream surface water quality and underlying groundwater quality. Since 2001 all activities at the Application Site have been completed in accordance with IPC Licence conditions. Furthermore, with respect to the welfare facilities, there has been no discharge of untreated wastewater at the Application Site. Based on the above, we consider that the residual effect to be negative, indirect, imperceptible, long-term effect on groundwater and surface water quality.

For the reasons outlined above and with the implementation of the control measures we consider that there has not been a significant effect on groundwater or surface water quality as a result of the operation of the supporting infrastructure during the Peat Extraction Phase of the Project.

8.8.1.6 Effects on Groundwater Abstractions

The potential for the peat extraction and ancillary activities to impact the local PWS and GWS. GWS and private groundwater well supplies was limited. The natural hydrological and hydrogeological regime of peat bog, with little groundwater recharge and high runoff rates, limits the potential effects that peat extraction may have had on local groundwater abstractions. Furthermore, the Application Site is not located within the mapped SPA area to any GWS or PWS. The residual effect is considered to be a neutral, imperceptible, indirect, long-term, unlikely effect on groundwater quality and groundwater quantity.

For the reasons outlined above, we consider that there has not been a significant effect on local groundwater abstractions during the Peat Extraction Phase of the Project.

8.8.1.7 Effects on Designated Sites

The potential for the peat extraction and ancillary activities to impact the hydrology of the Lower River Suir SAC and the Cabragh Wetlands pNHA is limited due to the length of the hydrological flowpath between the Application Site and these designated sites (>17km). Proven and effective control measures have also been implemented to limit the runoff from the Application Site to original greenfield runoff rates. The Application Site has also been operating under IPC licence conditions since 2001. The residual effect is imperceptible, long-term, negative, indirect likely effect on the hydrology (flows and water quality) of the Lower River Suir SAC and the Cabragh Wetlands pNHA.

For the reasons outlined above and with the implementation of the outlined control measures we consider that there has not been a significant effect on the hydrology of the Lower River Suir SAC and the Cabragh Wetlands pNHA during the Peat Extraction Phase of the Project.

8.8.1.8 Effects on the WFD Status of Surface and Groundwater Bodies

As the 1st WFD cycle was completed in 2010-2015, no WFD status existed for much of the Peat Extraction Phase. However, EPA Q-rating values are available from 2002 to 2017 for all watercourses downstream of the Application Site. The data shows a relatively stable trend in Q-values during this period with the majority of watercourses fluctuating between Q3 ("Poor" Q-status) and Q4 ("Good" Q-status), being either moderately polluted or unpolluted. Changes in water quality during this period cannot be attributed solely to peat extraction activities which were being scaled back at this time, and likely also reflect other pressures in the catchments. We consider that with the implementation of the control measures in accordance with IPC Licence Requirements the status of the SWBs were comparable to those recorded in the 1st WFD cycle (2010-2015).

The drainage systems were designed to reduce runoff to greenfield runoff rates while the IPC licence controls also ensured high quality runoff from the Application Site.

In addition, the underlying Thurles and Templemore GWBs achieved "Good" status in all WFD cycles and IPC control measures ensured the protection of groundwater quality.

Therefore, we consider that there has been an not significant, short-term, negative and indirect effect on downstream surface waterbody status and no residual effect on groundwater body status.

A full WFD Compliance Assessment is included as Appendix 8-2, Volume 3.

With the implementation of the IPC licence controls no significant effects on the status of downstream SWBs or the underlying GWBs have occurred during the Peat Extraction Phase of the Project.

8.8.2 Current Phase (2017 - Present Day)

8.8.2.1 Effects of Bog Drainage on Bog Hydrogeology

Following the implementation of the Rehabilitation Phase 1 works (extensive drain blocking and hydrological management), the Application Site is likely wetter and retaining more water than during the Peat Extraction Phase. These hydrological/hydrogeological conditions will allow for the slow recolonisation of the Application Site which will eventually become a naturally functioning peatland. As such, we consider the residual effects of the Rehabilitation Phase 1 works completed during the Current Phase to have a moderate, positive, direct, long-term effect on local peat bog hydrology/hydrogeology.

For the reasons outlined above we consider that the Rehabilitation Phase 1 works will have a significant effect on local bog hydrogeology within the Application Site.

8.8.2.2 Effects of Bog Drainage on Downstream Surface Water Hydrology/Quality

Following the implementation of the rehabilitation plans, the Application Site will be wetter, will retain more water, will recolonise with vegetation slowly, and will eventually become a naturally functioning peatland with much-reduced silt and nutrient output. As such, we consider the residual effects of the rehabilitation plan to be a moderate, positive, indirect, long-term effect on downstream surface water hydrology and water quality.

For the reasons outlined above we consider that the Rehabilitation Phase 1works will have a significant effect on downstream water quality and quantity.

8.8.2.3 Contamination of Groundwater by Leakages and Spills

From a review of the available AER reports, we understand that no significant fuel spills or wastewater discharges have occurred during this period. Therefore, the residual effect is a negative, imperceptible, short-term, indirect unlikely effect on groundwater quality.

For the reasons outlined above and with the implementation of the IPC Licence conditions we consider that there has not been a significant effect on local groundwater quality during the Current Phase of the Project.

8.8.2.4 Contamination of Surface Water by Leakages and Spills

From a review of the available AER reports, we understand that no significant fuel spills or wastewater discharges have occurred during this period. Therefore, the residual effect is a negative, imperceptible, short-term, indirect, unlikely effect on surface water quality.

For the reasons outlined above and with the implementation of the IPC Licence conditions we consider that there has not been a significant effect on downgradient surface waterbodies during the Current Phase of the Project.

8.8.2.5 Effects of Fertilizer Application on Downstream Surface Water Quality

Strict mitigation measures were implemented in regard to the application of fertiliser at the Application Site to date to ensure surface water quality was not impacted. As such, we consider the residual effects of the fertiliser application during the Rehabilitation Phase 1works to be an imperceptible, negative, indirect, short-term effect on downstream surface water quality.

For the reasons outlined above and with the implementation of the mitigation measures, we consider that there has not been a significant effect on downstream water quality.

8.8.2.6 Effects on Groundwater Abstractions

For the reasons outlined above in Section 8.6.2.6 and due to the lower levels of activity onsite during the Current Phase of the Project, that there has not been any residual effect on groundwater abstractions.

For the reasons outlined above and with the implementation of the IPC Licence conditions we consider that there has not been a significant effect on groundwater resources and abstractions during the Current Phase of the Project.

8.8.2.7 Effects on Designated Sites

Due to the reasons outlined above, and with the implementation of the Phase 1 Rehabilitation works the Application Site will likely be wetter, will retain more water, will recolonise with vegetation slowly, and will eventually become a naturally functioning peatlands and or wetlands with much-reduced silt and nutrient output. It is considered that consider the likely residual effect to be moderate, positive, indirect, long-term effects on the Lower River Suir SAC and the Cabragh Wetlands pNHA.

For the reasons outlined above and with the implementation of the IPC Licence conditions we consider that there has not been a significant effect on downgradient designated sites including the Lower River Suir SAC and the Cabragh Wetlands pNHA during the Current Phase of the Project.

8.8.2.8 Effects on WFD Status of Surface and Groundwater Bodies

No change in the qualitative or quantitative status of the receiving waterbodies will have occurred following the cessation of peat extraction. Due to the reasons outlined above, we consider the residual effect is a neutral, imperceptible, short-term, indirect, unlikely effect on WFD status of downstream surface waterbodies and underlying groundwater bodies.

With the implementation of the IPC Licence conditions we consider that there has not been a significant effect on WFD status during the Current Phase of the Project.

8.8.3 Remedial Phase

8.8.3.1 Effects of Bog Drainage on Bog Hydrogeology

Following the implementation of the proposed Rehabilitation Phase 1 and 2 works, the Longfordpass, Littleton, Lanespark and Derryvella Bogs will likely be wetter, will retain more water, will recolonise with vegetation slowly, and will eventually become a naturally functioning peatland. As such, we consider the residual effects of the rehabilitation plan to be moderate, positive, direct, long-term effect on local peat bog hydrology/hydrogeology.

For the reasons outlined above we consider that the proposed Rehabilitation Phase 1 and Rehabilitation Phase 2 works will have a significant effect on local bog hydrogeology within the Longfordpass, Littleton, Lanespark and Derryvella Bogs.

8.8.3.2 Effects of Bog Drainage on Downstream Surface Water Hydrology/Quality

Following the implementation of the proposed Rehabilitation Phase 1 and 2 works, the Longfordpass, Littleton, Lanespark and Derryvella Bogs will be wetter, will retain more water, will recolonise with vegetation slowly, and will eventually become a naturally functioning peatland with much-reduced silt and nutrient output. As such, we consider the residual effects of the rehabilitation plan to be a moderate, positive, indirect, long-term effect on downstream surface water hydrology and water quality.

For the reasons outlined above we consider that the proposed Rehabilitation Phase 1 and Rehabilitation Phase 2 works will not have a significant effect on downstream water quality and quantity.

8.8.3.3 Contamination of Groundwater by Leakages and Spills

The use and storage of hydrocarbons and small volumes of chemicals is a standard risk associated with all construction or development sites. Proven and effective measures to mitigate the risk of spills and leaks will be implemented during the Rehabilitation Phase 1 and Rehabilitation Phase 2 works. It is considered that the residual effect to be negative, imperceptible, direct, short-term, unlikely effect on groundwater quality.

For the reasons outlined above and with the implementation of the mitigation measures, we consider that there will not be a significant effect on groundwater quality.

8.8.3.4 Contamination of Surface Water by Leakages and Spills

The use and storage of hydrocarbons and small volumes of chemicals is a standard risk associated with all construction sites. Proven and effective measures to mitigate the risk of spills and leaks will be implemented throughout the Rehabilitation Phase 1 and Rehabilitation Phase 2 works. Therefore, the residual effect is imperceptible, negative, direct, short-term, unlikely effect on surface water quality.

For the reasons outlined above and with the implementation of the mitigation measures, we consider that there will not be a significant effect on surface water quality.

8.8.3.5 Effects of Fertilizer Application on Downstream Surface Water Quality

The application of fertiliser, as part of the Rehabilitation Phase 1 and Rehabilitation Phase 2 works will occur in small areas of the Derryvella Bog and represent very small area of the overall Application Site. Fertiliser application may also be required, as part of the ongoing Rehabilitation Phase 1 works, in Littleton, Lanespark and Longfordpass bogs where natural re-colonisation is deemed to be unsatisfactory. Strict mitigation measures have been proposed in regard to the application of fertiliser to ensure surface water quality is not impacted. As such, we consider the residual effects of the proposed fertilisation to be an imperceptible, negative, indirect, short-term effect on downstream surface water quality.

For the reasons outlined above and with the implementation of the mitigation measures, we consider that the proposed fertilisation associated with the rehabilitation plans will not have a significant effect on downstream water quality.

8.8.3.6 Effects on Groundwater Abstractions

There will be no effect on groundwater resources and existing abstractions.

8.8.3.7 Effects on Designated Sites

Due to the reasons outlined above, and with the implementation of the Rehabilitation Phase 2 works Derryvella Bog will likely be wetter, will retain more water, will recolonise with vegetation slowly, and will eventually become a naturally functioning peatlands and or wetlands with much-reduced silt and nutrient output. The potential for effects is further limited given the scale of Derryvella Bog in comparison to the total catchment of the River Suir where it becomes designated as the SAC (~44,000 ha).It is therefore considered that the likely residual effect will be an imperceptible, positive, indirect, long-term effect on the Lower River Suir SAC and the Cabragh Wetlands pNHA.

For the reasons outlined above and with the implementation of the mitigation measures, we consider that there will not be a significant effect on the Lower River Suir SAC or the Cabragh Wetlands pNHA.

8.8.3.8 Effects on WFD Status of Surface and Groundwater Bodies

Due to the local hydrogeological regime at the Application Site (very limited groundwater recharge), coupled with the implementation of the proposed mitigation measures for the protection of surface water quality, and the additional hydrological benefits associated with bog rehabilitation (improved surface water quality and improved water attenuation), we consider that there will be a slight, positive, long-term, indirect, likely effect on the WFD status of downstream SWBs. There will be no residual effect on the WFD status of the underlying GWBs.

With the implementation of the mitigation measures outlined above there will be no significant effects resulting from the Rehabilitation Phase 2 works at Derryvella Bog. The Remedial Phase will not result in the deterioration in the WFD status of any surface or groundwater body nor will it jeopardise the attainment of good status in the future.

8.9 Cumulative and Indirect effects

8.9.1 Peat Extraction Phase (July 1988 - 2017)

8.9.1.1 Cumulative Effects of Third-Party and Private Peat Cutting

Following the Turf Development Act of 1981, Bord na Móna oversaw a private turf development scheme which provided grants to private bog developers. Third-party extraction was undertaken on turbary plots at the periphery of the Application Site and as such exact locations and volumes are not available.

The Peat Extraction Phase of the Project would potentially have interacted with these minor turbary activities and could have contributed to a deterioration of downstream surface water quality through the emissions of elevated concentrations of suspended solids and ammonia. Bog drainage would also have been required for these turbary activities and cumulative impacts on the local bog hydrology may have occurred.

Pathways: Peat drainage and surface water pathways.

Receptors: Surface water quality in downgradient waterbodies (i.e. the Breagagh, Drish, Clover and Black (Two Mile Borris) rivers and associated tributaries) and bog hydrogeology.

Control Measures:

Control measures relating to the protection of water quality are outlined in Sections 8.7.1 above.

Impact Assessment:

No control measures beyond those required to comply with the IPC licence conditions were implemented. Control measures were also implemented by Bord na Móna in an ad hoc manner between July 1988 and 2001 by implementation of the pre-existing surface water management system.

The areas of third-party peat cutting were small in comparison to the peat extraction and ancillary activities completed by Bord na Móna. The third-party peat cutting was also completed at bog margins.

By July 1988 the vast majority of the Application Site was already artificially drained. Consequently, the continued drainage of the Application Site during the Peat Extraction Phase of the Project would have been limited in its potential to alter the hydrological regime in downstream watercourses. However, during the Peat Extraction Phase, there was an ongoing risk of elevated concentrations of suspended solids making their way into downstream surface watercourses from the erosion of peat sediment via the bog drainage network. This potential pathway would pose a significant risk to local surface water quality in the Breagagh, Clover, Black (Two Mile Borris) and Drish rivers and their associated tributaries. Other water quality parameters of concern are ammonia and Chemical Oxygen Demand (COD).

As outlined, EPA Q-values throughout the Peat Extraction Phase of the Project fluctuate, there is no clear significant negative trend in terms of surface water quality between July 1988 and 2017, with some nearby EPA monitoring locations recording an improved Q-rating during this period. Some improved sediment control measures were installed at the Application Site in the late 1990s and early 2000s and water quality discharge licence limits have been in place since 2001 in accordance with IPC licensing. The available monitoring data indicate that improvements in downstream water quality have not been significant, and this is because there are other activities in the catchments that effect water quality and also that the baseline water quality has not changed significantly during the Peat Extraction Phase of the Project.

Cumulative Residual Effects: Any third-party or private peat cutting completed at the Application Site during the Peat Extraction Phase of the Project (July 1988 – 2017) would have been infinitely small, in terms of the peat extraction areas and the volumes of peat being removed from the Application Site, in comparison to the Bord na Móna operations. There are no indications from surface water quality monitoring data that third-party peat extraction in combination with Bord na Móna peat extraction activities had a significant impact on downstream surface water quality. Therefore, any cumulative effects on local bog hydrogeology and downstream local surface water quality would have been consistent with emerging trends within the downstream catchments when compared to those which would have resulted solely from the large scale, commercial Bord na Móna peat harvesting operations. The residual effect is a moderate, long-term, negative, indirect likely effect on downgradient waterbodies (i.e. the Breagagh, Drish, Clover and Black (Two Mile Borris) rivers and associated tributaries).

For the reasons outlined above we consider that there has not been a significant cumulative effect during the Peat Extraction Phase of the Project.

8.9.1.2 Cumulative Effects with Agriculture

The Application Site is drained by the Breagagh, Drish, Clover and Black (Two Mile Borris) rivers. Agriculture is the largest land use in the surrounding lands and in the wider catchments/sub-catchments. Corine land cover maps (1990 – 2018) show that the majority of lands surrounding the Application Site have been used for agricultural purposes during the Peat Extraction Phase of the Project (July 1988 – 2017).

Agriculture is the largest pressure on water quality in Ireland. Agricultural practices such as the movement of soil and the addition of fertilizers and pesticides can lead to nutrient losses and the entrainment of suspended solids in local surface watercourses. This can have a negative impact on local and downstream surface water quality.

The Peat Extraction Phase of the Project would potentially have interacted with these agricultural activities and could have contributed to a deterioration of downstream surface water quality through the emissions of elevated concentrations of suspended solids and ammonia.

Pathways: Surface water pathways.

Receptors: Surface water quality in downgradient waterbodies (i.e. the Breagagh, Drish, Clover and Black (Two Mile Borris) rivers and their associated tributaries).

Control Measures:

No control measures beyond those required to comply with the IPC licence conditions are deemed necessary. These control measures have been implemented by Bord na Móna since 2001 and build upon pre-existing surface water management system which was already in operation at the Application Site (July 1988 – 2001).

Impact Assessment:

By July 1988 the vast majority of the Application Site had already been artificially drained. Consequently, the continued drainage of the Application Sites during the Peat Extraction Phase of the Project would have been limited in its potential to alter the hydrological regime in downstream watercourses. However, during the Peat Extraction Phase, there was an ongoing risk of elevated concentrations of suspended solids and ammonia making their way into downstream surface watercourses via the bog drainage network. This potential pathway would pose a significant risk to downstream local surface water quality.

However, while the EPA Q-values throughout the Peat Extraction Phase of the Project fluctuate, there is no clear significant negative trend in terms of surface water quality between July 1988 and 2017. Furthermore, EPA Q-stations located upstream of the Application Site fluctuate in a similar manner indicating that there are other activities in the catchment, including agriculture, which had a greater effect on downstream surface water quality.

Some improved sediment control measures were installed at the Application Site in the late 1990s and early 2000s and water quality discharge licence limits have been in place since 2001 in accordance with IPC licensing. Any cumulative effects will have been reduced in subsequent years with environmental monitoring showing that since 2001, the emission have been largely compliant with respect to ammonia, suspended solids and COD.

If significant cumulative effects were occurring, we would expect to see an improvement in downstream water quality following the implementation of the IPC licence control measures. However, the available monitoring data indicate that improvements in downstream water quality have not been significant. This indicates that the wider land use in the catchment, which is dominated by agriculture, has a greater effect on surface water quality than the peat extraction and ancillary activities within the Application Site and any associated cumulative effects.

Cumulative Residual Effect: The baseline July 1988 environment comprised of a drained peatland located within a largely agricultural catchment. There are no indications from surface water quality monitoring data that peat extraction and ancillary activities within the Application Site in combination with agricultural activities in the wider catchment had a significant impact on downstream surface water quality. The EPA Q-values suggest that any cumulative effects were small in comparison to the effects resulting solely from agricultural practices in the wider catchment. Therefore, any cumulative effects on local downstream local surface water quality would have been consistent with emerging trends within the downstream catchments when compared to those which would have resulted solely from the large scale, commercial Bord na Móna peat extraction operations. The residual effect is a moderate, long-term, negative, indirect, likely cumulative effect on downgradient waterbodies (i.e. the Breagagh, Drish, Clover and Black (Two Mile Borris) rivers).

For the reasons outlined above we consider that there has not been a significant cumulative effect during the Peat Extraction Phase of the Project.

8.9.1.3 Cumulative Effects with Forestry

There are some small areas of coniferous forestry in the lands surrounding the Application Site. These areas of forestry do not form part of the Substitute Consent application.

The most common water quality problems arising from forestry relate to the release of sediment and nutrients to the aquatic environment and impacts from acidification. Forestry may also give rise to modified stream flow regimes caused by associated land drainage.

Due to the close proximity of these areas of coniferous forestry to the Application Site and given that they drain to the same river waterbodies as the Application Site, the potential cumulative effects on downstream water quality and quantity need to be assessed.

Pathways: Peat drainage and surface water pathways.

Receptors: Surface water quality and quantity in downgradient waterbodies (i.e. the Breagagh, Drish, Clover and Black (Two Mile Borris) rivers and associated tributaries).

Control Measures:

No control measures beyond those required to comply with the IPC licence conditions are deemed necessary. These control measures have been implemented by Bord na Móna since 2001 and build upon pre-existing surface water management system which was already in operation at the Application Site (July 1988 – 2017).

Impact Assessment:

The areas of coniferous forestry were small in comparison to the peat extraction and ancillary activities completed by Bord na Móna.

By July 1988 the vast majority of the Application Site had already been artificially drained. Consequently, the continued drainage of the Application Site during the Peat Extraction Phase of the Project would have been limited in its potential to alter the hydrological regime in downstream watercourses. However, during the Peat Extraction Phase, there was an ongoing risk of elevated concentrations of suspended solids making their way into downstream surface watercourses from the erosion of peat sediment via the bog drainage network. This potential pathway would pose a significant risk to local surface water quality. Other water quality parameters of concern are ammonia and Chemical Oxygen Demand (COD).

As outlined previously, EPA Q-values throughout the Peat Extraction Phase of the Project fluctuate, there is no clear significant negative trend in terms of surface water quality between July 1988 and 2017. In addition, there is no distinguishable improvement in surface water quality following the implementation of the improved sediment control measures in the late 1990s and early 2000s and the IPC licence control measures in 2001. The monitoring data indicates there are other activities in the catchments which effect water quality and also that the baseline water quality was reasonably good and has not changed significantly during the Peat Extraction Phase of the Project.

Cumulative Residual Effects: By July 1988 peat extraction and ancillary activities were already well established across the majority of the Application Site. Therefore, the baseline environment contained peat extraction across much of the Application Site. Any cumulative effects with the commercial forestry activities will have been reduced in subsequent years as Bord na Móna implemented improved sediment control measures throughout the 1990s and IPC licencing controls in 2001.

EPA Q-values in downstream watercourses fluctuate throughout this phase of the Project, there is no clear negative trend in terms of surface water quality between July 1988 and 2017.

Therefore, the cumulative effect of the Peat Extraction Phase of the Project and the forestry activities in the surrounding lands is moderate, long-term, negative, indirect, likely effect on downgradient waterbodies (i.e. Breagagh, Clover, Black (Two Mile Borris) and Drish rivers, and their associated tributaries).

For the reasons outlined above we consider that there has not been a significant cumulative effect during the Peat Extraction Phase of the Project.

8.9.1.4 Cumulative Effects with Water Supply at the Briquette Factory

Water supply to the Briquette Factory sited at the Works was from the River Breagagh, located south of the Works and outside the Application Site boundary. Water from the river was supplied to the Briquette Factory via a pump house. The Briquette Factory closed in 2018.

There was the potential for cumulative effects given that water was abstracted from the Breagagh River and the Application Site drained to the Breagagh River. However, the potential for quantitative cumulative effects in terms of flow volumes in the Breagagh River was limited as the peat extraction and ancillary activities completed at the Application Site did not include any abstraction of surface water.

Pathways: Peat drainage and surface water pathways.

Receptors: Surface water quality and quantity in downgradient waterbodies (i.e. the Breagagh River).

Control Measures:

No control measures beyond those required to comply with the IPC licence conditions were deemed necessary. These control measures have been implemented by Bord na Móna since 2001 and build upon pre-existing surface water management system which was already in operation at the Application Site (July 1988 – 2017).

Impact Assessment:

The surface water management system at the Application Site was designed to ensure that the peat extraction and ancillary activities completed by Bord na Móna did not have a significant effect on downstream surface watercourses including the Breagagh River. Therefore, there was no potential for cumulative effects with the abstraction from the Breagagh River. It is also noted that the WFD do not list hydromorphology or abstractions as a significant pressure on the Breagagh River.

Cumulative Residual Effects: The cumulative effect of the Peat Extraction Phase of the Project and the abstraction from the Breagagh River for the water supply to the Littleton Briquette factory was a slight, long-term, negative, direct, likely effect on downgradient waterbodies (i.e. Breagagh River.

For the reasons outlined above we consider that there has not been a significant cumulative effect during the Peat Extraction Phase of the Project.

8.9.2 Current Phase (2017 – Present Day)

8.9.2.1 Cumulative Effects with Agriculture

The Application Site is situated within a largely agricultural catchment and any activities within the Application Site have the potential to interact with the agricultural practices in the surrounding lands and could contribute to a deterioration of downstream surface water quality.

The potential effects are similar to those associated with the Peat Extraction Phase of the Project but of a significantly reduced magnitude due to the reduced scale of any works. During this phase of the Project activities onsite were limited to site decommissioning (stockpile removal etc), the Phase 1 Rehabilitation works, maintenance of the existing drainage system and environmental monitoring.

Pathways: Surface water pathways.

Receptors: Surface water quality in downgradient waterbodies (i.e. the Breagagh, Drish, Clover and Black (Two Mile Borris) rivers, and their associated tributaries).

Control Measures:

All operations completed during the Current Phase of the Project were done in accordance with IPC licence requirements and no additional control measures are deemed necessary.

Cumulative Residual Effects: There are no indications from EPA Q-values or environmental monitoring data that there has been a significant impact on downstream surface water quality. No cumulative effects have occurred.

For the reasons outlined above and with the implementation of IPC licence control measures, we consider that there has not been a significant cumulative effect during the Current Phase of the Project.

8.9.2.2 Cumulative Effects with Forestry

There are some small areas of coniferous forestry in the lands surrounding the Application Site, and given that they drain to the same river waterbodies as the Application Site, the potential cumulative impacts on downstream water quality and quantity need to be assessed.

The potential effects are similar to those associated with the Peat Extraction Phase of the Project but of a significantly reduced magnitude due to the reduced scale of any works. During this phase of the Project activities onsite were limited to site decommissioning (stockpile removal etc), the Rehabilitation Phase 1 works, maintenance of the existing drainage system and environmental monitoring.

Pathways: Surface water pathways.

Receptors: Surface water quality in downgradient waterbodies (i.e. the Breagagh, Drish, Clover and Black (Two Mile Borris) rivers, and their associated tributaries).

Control Measures:

All operations completed during the Current Phase of the Project were done in accordance with IPC licence requirements and no additional control measures are deemed necessary.

Cumulative Residual Effects: There are no indications from EPA Q-values or environmental monitoring data that there has been a significant effect on downstream surface water quality. No cumulative effects have occurred.

For the reasons outlined above and with the implementation of IPC licence control measures, we consider that there has not been a significant cumulative effect during the Current Phase of the Project.

8.9.2.3 Cumulative Effects with Third Party and Private Peat Cutting

Third-party extraction was undertaken on turbary plots at the periphery of the Application Site during the Current Phase.

The potential effects are similar to those associated with the Peat Extraction Phase of the Project but of a significantly reduced magnitude due to the reduced scale of any works. During this phase of the Project activities onsite were limited to site decommissioning (stockpile removal etc), the Rehabilitation Phase 1 works, maintenance of the existing drainage system and environmental monitoring.

Pathways: Peat drainage and surface water pathways.

Receptors: Surface water quality in downgradient waterbodies (i.e. the Breagagh, Drish, Clover and Black (Two Mile Borris) rivers and associated tributaries) and bog hydrogeology.

Control Measures:

Control measures relating to the protection of water quality are outlined in Section 8.7.2 above.

Impact Assessment:

No control measures beyond those required to comply with the IPC licence conditions were implemented. Control measures were also implemented by Bord na Móna in an ad hoc manner between July 1988 and 2001 by implementation of the pre-existing surface water management system.

The areas of third-party peat cutting were small and limited to the bog margins.

All operations completed during the Current Phase of the Project were done in accordance with IPC licence requirements and no additional control measures are deemed necessary.

Cumulative Residual Effects: There are no indications from EPA Q-values or environmental monitoring data that there has been a significant effect on downstream surface water quality. No cumulative effects have occurred.

For the reasons outlined above and with the implementation of IPC licence control measures, we consider that there has not been a significant cumulative effect during the Current Phase of the Project.

8.9.3 Remedial Phase

8.9.3.1 Cumulative Effects with Proposed Littleton Wind Farm

Bord na Móna intend to utilise the Application Site for both peatland rehabilitation and wind energy infrastructure in order to facilitate environmental stabilisation of the bog and to optimise climate action benefits.

The proposed Littleton Wind Farm is a 11 no. turbine wind farm. As detailed in the rEIAR for the proposed wind farm the overall footprint of the wind farm is <2.13% of the total area of the site. The Decommissioning and Rehabilitation plan for the Application Site will be updated to incorporate the proposed wind farm infrastructure, with the key objectives of the rehabilitation plan i.e. rewetting and revegetation, occurring between and surrounding the proposed wind farm infrastructure.

The rEIAR for the proposed Littleton Wind Farm development details the potential hydrological and hydrogeological issues relating to the construction, operation and decommissioning phases of the proposed wind farm and proposes a suite of detailed, tried and tested, best practice mitigation measures designed to ensure that the proposed development does not in any way have a negative impact on downstream surface water quality and quantity.

The main risk to downstream surface water quality and the underlying groundwater quality will occur during the construction phase of the proposed wind farm development when there is greatest activity on site and large volumes of material being excavated, increasing the potential for elevated concentrations of suspended solids in runoff and heightening the risk of hydrocarbon spillages and leaks. However, extensive mitigation measures will be utilised to protect surface water quality during all phases of the proposed wind farm development. These mitigation measures will utilise and enhance the existing bog drainage network to ensure the proposed development will be in accordance with IPC licence conditions.

During the operational phase of the proposed wind farm development, the majority of the remedial rehabilitation measures, such as drain blocking, will have been completed and there will be little activity on site with the exception of monitoring and maintenance. The increased surface water runoff associated with the wind farm development infrastructure will be offset by the increased surface water attenuation at the site following the implementation of the remedial measures.

Water quality of discharges from restored peatlands generally improves as a result of bog rehabilitation measures and site restoration. The proposed rehabilitation measures at the Application Site include drain blocking which will improve water attenuation by slowing the movement of water through the Application Site and the release of water downstream. Re-vegetation of the Application Site will stabilise substrates and reduce the risk of elevated concentrations of suspended sediment in downstream watercourses.

Pathways: Peat drainage and surface water pathways.

Receptors: Surface water quality and quantity in the receiving streams (Breagagh River, North Glengoole Stream, Clover River, Black (Two Mile Borris) River, Drish River and all associated tributaries and water-dependent ecosystems and bog hydrogeology.

and bog hydrogeology.

Mitigation Measures:

No mitigation measures beyond those required to comply with the IPC licence conditions and those outlined in Sections 8.7.2 and Section 8.7.3 are deemed necessary.

Whilst the works which will be undertaken as part of the ongoing Phase 1 rehabilitation works and the proposed Phase 2 rehabilitation works in Derryvella Bog are minor in nature in comparison to the construction of a wind farm development, all works will be completed under licence from the EPA and will be done in accordance with 'best practice' procedures.

Likely Cumulative Residual Effects: The proposed wind farm development contains a very small footprint within the Application Site and does not overlap with the Rehabilitation Phase 2 work areas. Effective mitigation measures have been proposed for the remedial phase of the Project (including the ongoing Rehabilitation Phase 1 works) and with the implementation of similar measures for all phases of the potential wind farm development the cumulative residual effect is a moderate, positive effect.

For the reasons outlined above we consider that there will not be a significant cumulative effect.

8.9.3.2 Cumulative Effects with Enhanced Rehabilitation Measures (PCAS)

In addition to the standard remedial measures as detailed in the rehabilitation plans for the bogs comprising the Application Site, Bord na Móna are also committed to enhanced peatland rehabilitation and restoration measures, subject to government funding, targeting c. 33,000ha in over 80 no. Bord na Móna bogs.

In the event that Littleton, Lanespark, or Longfordpass bogs are selected for PCAS in the future the cumulative effects are assessed herein. In the event that future PCAS plans are not implemented or prepared, the Application Site will be rehabilitated in line with the rehabilitation plans presented in Appendix 4-2, Volume 3.

The implementation of PCAS measures would provide greater surface water attenuation and surface water quality benefits in and downstream of the restoration areas. Any potential PCAS measures and the standard remedial measures would have a positive cumulative effect on bog hydrogeology and surface water quality.

Pathways: Peat drainage and surface water pathways.

Receptors: Surface water quality and quantity in the receiving streams (Breagagh River, North Glengoole Stream, Clover River, Black (Two Mile Borris) River, Drish River and all associated tributaries and water-dependent ecosystems. and bog hydrogeology.

Mitigation Measures: No mitigation measures beyond those required to comply with the IPC licence conditions and those outlined in Section 8.7.3 are deemed necessary.

Likely Cumulative Residual Effects: If PCAS works are completed at the Application Site this would have a positive effect on the local bog hydrogeological environment and the local hydrological environment (in terms of surface water quality and attenuation). The cumulative residual effect is a moderate, positive effect.

For the reasons outlined above we consider that there would not be a significant cumulative effect.

8.9.3.3 Cumulative Effects with Third Party and Private Peat Cutting

Third-party extraction may continue during the Remedial Phase t the margins of the Application Site. The potential effects are similar to those associated with the Current Phase of the Project.

Pathways: Peat drainage and surface water pathways.

Receptors: Surface water quality in downgradient waterbodies (i.e. the Breagagh, Drish, Clover and Black (Two Mile Borris) rivers and associated tributaries) and bog hydrogeology.

Control Measures:

No mitigation measures beyond those required to comply with the IPC licence conditions and those outlined in Section 8.7.3 are deemed necessary.

Likely Cumulative Residual Effects: No cumulative effects will occur.

For the reasons outlined above and with the implementation of IPC licence control measures, we consider that there would not be a significant cumulative effect.

8.10 Major Accidents and Disasters

The main risk of Major Accidents and Disasters (MADs) at peatland sites is related to peat stability. However, due to the low-lying and flat nature of the Application Site, slope stability has posed no risk at the Application Site during any phases of the Project.

Flooding can also result in downstream MADs. However, there has been no risk of flooding downstream of the Application Site as a result of the historic and/or proposed activities at the site due to the low lying nature of the Application Site and the attenuation provided by the on-site drainage system, in particular the presence of the settlement ponds.

There are no other foreseeable MADs.

8.11 Human Health

Due to the nature of the peat extraction process, combined with the mitigation measures and environmental monitoring implemented at the site, no water related impacts on human health have likely resulted from the Peat Extraction Phase nor the Current Phase of the Project.

Furthermore, the Remedial Phase will pose no risk to human health and will likely result in the improvement in local surface water quality.

8.12 Monitoring

Environmental monitoring will continue as per the existing IPC conditions until the current IPC licence is surrendered.

This monitoring will encompass surface water sampling to ensure that the discharge from the Application Site remains below the existing IPC emission limit values, thereby protecting downstream surface water quality.

It is also likely that some monitoring will be proposed in order to evaluate the success of the rehabilitation plans. This shall include groundwater monitoring in the form of piezometers which will allow for the measurement of the peat groundwater table and assess the impact of the proposed rehabilitation measures, such as drain blocking, which are designed to raise the local peat groundwater table.

8.13 References

Bord na Móna (2026): Longfordpass Bog Cutaway Bog Decommissioning and Rehabilitation Plan.

Bord na Móna (2026): Littleton Bog Cutaway Bog Decommissioning and Rehabilitation Plan.

Bord na Móna (2025): Lanespark Bog Cutaway Bog Decommissioning and Rehabilitation Plan.

CIRIA, 2006: Guidance on 'Control of Water Pollution from Linear Construction Projects' (CIRIA Report No. C648, 2006).

CIRIA, 2006: Control of Water Pollution from Construction Sites - Guidance for Consultants and Contractors. CIRIA C532. London, 2006.

DoHLG, 2006: Wind Farm Development Guidelines for Planning Authorities.

DOHLG, 2003: Water Action Plan. A River Basin Management Plan For Ireland.

Environmental Protection Agency (2022): Guidelines on the Information to be contained in Environmental Impact Assessment Reports.

GSI (2003): Thurles Groundwater Body Characterisation Report.

GSI (2003): Templemore Groundwater Body Characterisation Report.

Harpenslager, S. F., Van Den Elzen, E. Kox, M.A.R., Smolders, A.J.P., Ettwig, F.F and Lamers, L.P.M. 2015. Rewetting former agricultural peatlands: Topsoil removal as a prerequisite to avoid strong nutrient and greenhouse gas emissions. Ecological Engineering, 84, 159-169.

IFI, 2016: Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Waters, Inland Fisheries Ireland (2016).

IGI, 2013: Guidelines for Preparation of Soils, Geology & Hydrogeology Chapters in Environmental Impact Statements, (Institute of Geologists Ireland, 2013).

Koskinen, M. Tahvanainen, T., Sarkkola, S., Menberu, M. W., Lauren, A., Sallantaus, T., Martilla, H., Ronkanen, A. K., Parviainen, M., Tolvanen, A., Koivusalo, H. & Nieminen, M. 2017. Restoration of nutrient-rich forestry-drained peatlands poses a risk for high exports of dissolved organic carbon, nitrogen, and phosphorus. Science of The Total Environment, 586, 858-869.

Negassa, W., Michalik, D., Klysubun, W and Leinweber, P. 2020. Phosphorus Speciation in Long-Term Drained and Rewetted Peatlands of Northern Germany. Soil Systems, 4.

NRA, 2005: Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes, (National Roads Authority, NRA, 2005).

PPG1 - General Guide to Prevention of Pollution (UK Guidance Note).

PPG5 – Works or Maintenance in or Near Watercourses (UK Guidance Note).

Pschenyckyj, C., Riondato, E., Wilson, D., Flood, K., O'Driscoll, C., Renou-Wilson, F, January 2021. Report produced for An Foram Uisce. Optimising Water Quality Returns from Peatland Management while Delivering Co-Benefits for Climate and Biodiversity).

FEHILY TIMONEY

DESIGNING AND DELIVERING
A SUSTAINABLE FUTURE

www.fehilytimoney.ie